6/-

12/6 o.P

ON THE

THEORY OF LOGIC.

Alice Woods.
Girton College.

ON THE

THEORY OF LOGIC:

AN ESSAY.

BY

CARVETH READ.

LONDON:
C. KEGAN PAUL & CO., 1, PATERNOSTER SQUARE.
1878.

PREFACE.

Three or four years ago a Travelling Scholarship was granted me by the Hibbert Trustees. One condition of holding it was that I should write something on some subject connected with my studies; and I was glad to have an opportunity of writing the following Essay.

Now that it is on the eve of publication I cannot help reflecting that almost every page is liable to two criticisms, (1) that it abounds with truisms, (2) that it strains after a spurious sort of originality. There is no sort of opposites which it is easier to unite than faults: but for the first of these I plead, that I have been dealing with the most general facts, and that it would be strange if these were not sometimes also the most obvious; and as to the second, I hope the

reader will do me the justice to believe, that I am not blind to the difference between discovering a new truth and finding new expressions for an old one.

My thanks are due to my friend Mr. E. S. Thompson, of Christ's College, for advice and suggestions upon many points of difficulty.

March, 1878.

TABLE OF CONTENTS.

CHAPTER I.

INTRODUCTION.

CHAPTER II.

OF RELATIONS.

CHAPTER III.

OF TERMS.

CHAPTER IV.

OF THE IMMEDIATE AND MEDIATE RELATIONSHIP OF SINGLE TERMS, ETC.

PART I.

Immediate Relationship of Single Terms.

PART II.

Mediate Relationship of Single Terms.

CHAPTER V.

OF CLASSES.

CHAPTER VI.

OF THE DISCOVERY OF CLASSES.

CHAPTER VII.

OF THE IMMEDIATE RELATIONSHIP OF CLASSES.

CHAPTER VIII.

OF HYPOTHETICALS.

CHAPTER IX.

OF THE MEDIATE RELATIONSHIP OF CLASSES.

CHAPTER X.

OF SECONDARY RELATIONS.

ON THE

THEORY OF LOGIC.

CHAPTER I.

INTRODUCTION.

1. *General Purposes.*

THE purposes of this Essay are chiefly two: 1. To restore to Logic the synthetic order of exposition; 2. To sketch an outline of the Science as consistently as possible from the matter-of-fact point of view. While pursuing these main ends, I endeavour to present the Science in its nakedness; on the one hand avoiding as much as possible the discussion of adjacent topics in Psychology and Metaphysics; and on the other hand refraining from suggesting practical applications: and this I do not out of a fastidious purism that fears to disfigure Logic, but because the practical bearings of the Science have recently been exhibited by writers more competent to do so.

2. *Order of Exposition.*

During the long period in which Logic was almost entirely confined to the Deductive department, it

attained by the care of multitudinous expositors an admirable order and neatness of arrangement. Beginning with what were regarded as its most abstract elements, it moved forward by stages of increasing complication, to the Syllogism with its imposing array of Mood and Figure, and all the perplexity of Hypotheticals:

R's own system more cumbrous still

presenting a symmetrical whole, bristling with elaborate detail and precise terminology, and impenetrable with mnemonics and bad verses. But since the development of Inductive Logic much of this formal excellence has been lost. The new doctrine, instead of being incorporated with the old, has merely been added to it. It is true that Mill explained to some extent the natural connection of the different parts of the Science, but he did not reorganise the whole accordingly. And Prof. Bain, though pointing out what the natural course of exposition would be, prefers to adopt another.* Thus the orderly succession of topics according to dependence and complexity is lost; and probably many still think that by the intrusion of Induction into the Science, its unity has been destroyed. I hope it may not prove so. My excuses for deviating from the example of authorities to whom I owe much are, that it is peculiarly anomalous for a Science, so old and fundamental among Sciences as Logic, not to conform to the plainest principles of scientific exposition; that to those who can really grasp the subject, the

* Logic, Introduction, § 55; cf. Mill. Logic, B. II. ch. i. § 3.

synthetic order is the easiest to follow and remember; that the example of coherence, precision, economy, and method, which a Science so expounded presents, has a good influence on the minds of most people, especially Englishmen; and that although there is an incipient tradition in favour of a different course, it cannot yet be too late to mend, in as much as the history of Logic in the future is likely to be very much longer than it has been in the past.

Returning, therefore, to the example of the older Logicians, I have endeavoured to mould in accordance with it the more copious materials of the modern Science: beginning with simpler elements and more general truths, interpolating topics formerly neglected, modifying to some extent the arrangement of the parts always recognized, omitting what now seems extraneous, and carrying the synthesis to a stage of greater definiteness. At the same time I have taken a point of view, which I am not aware that any previous writer on Logic has taken and consistently maintained; and which for want of a better expression, I have called the matter-of-fact point of view.

3. *Logic an 'Objective' Science.*

This has been done at the instigation of certain passages in the works of Mr. H. Spencer, particularly *Principles of Psychology*, Part VI., ch. 8; where it is announced, and I think proved, that Logic is an

Objective Science, or Science of objective existence, "a Science that formulates the most general laws of correlation among existences considered as objective:" language which I could almost adopt, if allowed to give a special explanation of the meaning of the word objective.

Modern Logicians have been roughly divisible into two schools: the Conceptualists who regard Logic as the Science or Art of Thought, that is, of certain Mental operations or products; and the Nominalists, who hold it to be concerned primarily with the use of language in thinking or reasoning. It is seldom however that an adherent of either view has consistently maintained his position. The Nominalist has continually to consider the reference of language to things or thoughts; and only a few Conceptualists have had the hardihood to pretend to exclude from Logic all that concerns the relation of thought to things. The thing, or matter-of-fact, is apt to confront every Logician before long, whatever theory he starts with; and so there have been some writers who held more or less clearly, that Logic is a Science of things. Those who show a strong leaning this way are called Materialists, because they seem to take more interest in the matter of any statement or process of thought than in its form; but its metaphysical associations make the name very misleading. Logical materialism, to use the name for once, has naturally been a note of those who have done anything to

advance the theory of Induction; but here again no one has been consistent. Among recent writers the most materialistic are, I suppose, Mill and Prof. Bain; and a word or two on their positions may throw some light on this Essay.

Rather gd criticism on Mill's view of Logi

Mill defines Logic to be "the Science of the operations of the Understanding which are subservient to the estimation of evidence: both the process itself of advancing from known truths to unknown, and all other intellectual operations in so far as auxiliary to this." * Such a definition prepares one for the statement in the *Examination of Hamilton* † that "Logic is not a science distinct from and co-ordinate with Psychology. So far as it is a science at all, it is a part or branch of Psychology. . . . . Its theoretic grounds are wholly borrowed from Psychology." Accordingly in the *Logic* we find chapters on *Inference*, on the *Functions of the Syllogism*, *Evidence of the Law of Causation*, and on *Abstraction or the Formation of Concepts;* all which (with others) contain more or less Psychological speculation. On the other hand, at the opening of the chapter on the *Import of Propositions*, we read :—"An inquiry into the Nature of Propositions must have one of two objects: to analyse the state of mind called belief, or to analyse what is believed. . . . . Logic, according to the conception here formed of it, has no concern with the act

* System of Logic; Introduction, § 7.

† Ch. xx. p. 445 (3rd edit.).

of judging or believing; the consideration of that act, as a phenomenon of the mind, belongs to another science." The other Science is presumably Psychology; although it seems strange to speak of that Science, of which Logic is said to be a branch, as "another Science." But it is more important to observe that Logic is here said to have no concern with the act of judging; though, surely, the act of judging is an "operation of the Understanding subservient to the estimation of evidence." In the *Examination* (p. 447), however, we read:—"He (Hamilton) says: 'Logic considers Thought not as the operation of thinking, but as its product; it does not treat of Conception, Judgment, and Reasoning; but of Concepts, Judgments, and Reasonings.' Let me begin by saying that I give my entire adhesion to this distinction." This passage agrees with that from the chapter on the *Import of Propositions*; but how does it agree with the definition of Logic; and how with the existence in the *System* of a chapter on the *Formation of Conceptions*?

I cannot reconcile these statements (and still others might be adduced of a similar kind); but the above definition of Logic is expressly given as only provisional, on the ground that a complete definition cannot be framed until the Science is further advanced: so that in the meanwhile there is some room for vacillation. I am sorry to say, however, that the definition first given (and no other is offered) is asserted to be "at all events a correct definition of the subject of

these volumes:" for that I must dispute. It appears to me that the subject of those immortal volumes is not the operations of the mind, but primarily the Laws of Nature and their Proof. And the satisfactory proof of a Law of Nature consists always according to that work, in bringing it within the sweep of some highest Law, which itself rests upon constant and uncontradicted experience. The highest Laws are the Axiom of the Syllogism, the Law of Causation with its derivative Canons of Experiment, the theory of Probabilities, and perhaps the doctrine of Kinds; all of which are plainly conceived by Mill to be Laws of Nature. Then in the First and Fourth Books there is much discussion of matters subsidiary to the discovery and proof of Laws, such as Names and Naming, Definition, Classification, &c.; and here again facts and the order of Nature are the chief concern. I grant that all this is interspersed with Psychological dissertations in answer to such questions as, If axioms are based on particular experiences, whence the feeling of their certainty? What is the true process of Inference? of Abstraction? Is Volition an efficient Cause? &c.: and the immense value of these passages I would be the last to question. But they form a comparatively small portion of the book; and I venture to think that, regarded merely as a treatise on Logic, the book would be nearly as complete without them. Of course the writer who maintains that names and propositions refer not to ideas, but to things, is free from the least

N.B.

taint of Conceptualism: as little is he a Nominalist. Although his position was not perfectly clear to himself, Mill was in reality a matter-of-fact Logician.

In Prof. Bain's great work I am not aware that Logic is anywhere, strictly speaking, defined; but it is described, its scope (as viewed in that work) is stated, and it is divided. In the *Introduction*, § 1, we read: "Logic may be briefly described as a body of doctrines and rules having reference to Truth;" and "the Truth of things, no matter what the subject be." And this, I suppose, is as much as to say that Logic is concerned with matter-of-fact in general (no matter what the subject be); or, in other words, with the most general laws of the correlation of phenomena. However, in § 2, we read: "Logic under every view involves frequent references to the laws and workings of the mind;" and so indeed throughout the work we find these frequent references; though an advance has been made on Mill's practice, as it appears to me, by collecting very many of them into the *Introduction*. But I can hardly admit that Logic really *involves* these references to the workings of the mind. It is true that some of the principal doctrines of Logic have been attained by the help of Psychology; but those doctrines once reached, the Psychological ladder may be kicked away. The doctrine of Relativity, for instance, fundamental in Logic, was first demonstrated in Psychology; but being demonstrated, or rather accepted, it is no longer a peculiarly

Psychological doctrine; for it is true not of the subjective order of phenomena only, but equally of the objective order; and it is in its universality, as prevailing in both orders, that it is, I conceive, fundamental in Logic. To be sure Logic is Science, and Science is knowledge, and in every act of knowledge (with some qualification in the case of psychological knowledge) Object and Subject are inseparable coefficients. But this is no more true of Logic than of the other Sciences. The Laws of Nature contemplated in Logic are in one aspect cognitions, but so are the Axioms of Mathematics; so are the Laws of Chemistry: and an account of any Law of Nature may be given from the subjective side. But there is a Science in which the nature of all cognitions is investigated once for all; and in no case, except Logic, is it deemed necessary to interrupt the course of a special Science, in order to give an account of the cognitions involved. What is present everywhere, once recognized, may be everywhere suppressed. The subjective element is present everywhere; and having been recognized in Psychology, may in all the other Sciences be overlooked. Indeed we may call it a postulate of the Abstract and Objective Sciences, that the subjective element may be neglected: we write, *Such is the course of Nature;* not, *Thus it appears to us.* The passion of British philosophers for psychological explanations and foundations, is perhaps due to the somewhat exclusive cultivation of

that Science which has always characterized British Philosophy.

Prof. Bain's position that Logic involves frequent references to the laws of the mind, is supported by citing the custom of Logicians. The custom must be admitted, but it does not guarantee its own propriety; it is only a sign of the imperfect state of Logic and adjacent Sciences. Metaphysics, Logic, Psychology, Rhetoric, &c., growing up together, and to some extent mutually dependent, have become very much tangled. Indeed, formerly the tangle was much worse than now: now it is at last possible to undo it; and the second object of this Essay is to clearly extricate Logic. I think we shall gain by it: though it must be allowed that hitherto the intermixture of Logic with other Sciences has had some good results: and as for the Psychological discussions in Prof. Bain's work, they appear to me to be always just and instructive. The real theme of that work, however, is, like that of Mill's, the Laws of Nature. And I do not think I can be wrong in claiming Prof. Bain as a Logician in whose view Logic is a Science of matter-of-fact.*

But the writer who has expressed this view most distinctly is Mr. Spencer, and I cannot do better than quote the passage:

"A distinction exists which, in consequence of its highly abstract nature, is not easily perceived,

* Cf. Logic, Appendix B.

between the Science of Logic and an account of the process of Reasoning. The distinction is in brief, this, that Logic formulates the most general laws of correlation among existences considered as objective; while an account of the theory of Reasoning, formulates the most general laws of correlation among the ideas corresponding to these existences. The one contemplates in its propositions, certain connections predicated, which are necessarily involved with certain other connections given: regarding all these connections as existing in the *Non-Ego*—not, it may be, under the form in which we know them, but in some form. The other contemplates the process in the *Ego* by which these necessities of connection come to be recognized."*

This passage points out clearly the nature of the error committed by those who regard the Theory of Reasoning, which is a part of Psychology, as an essential part of Logic. But it does not bring out quite all that I mean by saying that Logic deals with matter-of-fact; for it includes in Logic some things that are not matter-of-fact, and excludes some things that are. To explain, let us first inquire—What are "existences considered as objective?"

The Object is rightly opposed to two other kinds of existence, real or supposititious; namely, the Subject, and the Noumenon. The Metaphysical universe is usually divided, I conceive, into Phenomena and

* Psychology, Part VI. ch. viii.

Noumena; and Phenomena are again classed as Subjective and Objective: and if Noumena are also sometimes similarly subdivided, the Noumenal Object or Subject is, or always ought to be, expressly qualified as Noumenal or Transcendent. Thus existences considered as merely objective should always be Phenomenal, and Phenomena are existences in the form in which we know them. According to Mr. Spencer, however, the connections regarded by Logic, or some of them, exist "in the *Non-Ego*, not it may be in the form in which we know them;" that is, I suppose, are Noumenal. I understand, then, that Mr. Spencer in this passage (as, I think, very often in the Metaphysical portions of his writings) means to include in the Object, or among existences considered as objective, not only objective Phenomena, but also Noumena, or at least some Noumena. Now whether the Noumenon be a reality or an illusion this is not the place to discuss, but probably most philosophers will admit that it is not a matter-of-fact; and, therefore, I do not include any connections that may exist in it within the scope of Logic. For who can tell whether relations of Likeness, Coexistence, and Succession, or anything parallel to these familiar entities, obtain in that untrodden realm?

Again, it is clear that among existences considered as objective, Mr. Spencer does not include the Subject; for "the most general laws of correlation among existences considered as objective," are treated as

equivalent to "certain connections regarded as existing in the *Non-Ego*." But the Subject is a matter-of-fact, and I wish to include it (in a sense to be presently explained) within the scope of Logic. This is why I can accept the description of Logic as an Objective Science only on condition of being allowed to give a special explanation of the word "objective," as here used. Strictly speaking, Object and Subject are mutually exclusive, that is, so far as the nature of the matter will admit; but as the Object is something contrasted with the Subject, so within the Subject itself some phenomena may be contrasted with others still more subjective. This happens in all psychological analysis; in which the Subject is often said to be made the object of study; and by putting a special strain upon the words, certain states of the Subject might then be said to be considered as objective. But far be it from me to contribute to confusion: and, therefore, I will not describe Logic as an Objective Science. It is, I hold, neither an Objective, nor a Subjective Science, nor partly one and partly the other, but is raised above the distinction of Subject and Object,—a universal Science, formulating the most general laws of correlation among existences whether objective or subjective.

Such the... theory of Reasoning will be included (ansd bel...

But now it may perhaps seem that, according to this account of Logic, it must include the Theory of Reasoning, which was lately excluded. Not at all. An account of the process of reasoning formulates the

most general laws of correlation among ideas corresponding with certain other existences, and (I may add) *regarded as corresponding with certain other existences.* Whereas Logic deals with ideas and their correlations as such, and not merely as corresponding with certain other existences. This distinction, it will be observed, is similar to that drawn by Mr. Spencer between Psychology and Biology.* That Logic may, nay, must so deal with subjective phenomena is obvious; for some at least of the relations which obtain in the Object, obtain also in the Subject—Likeness, Succession, and in some degree Coexistence: and so far as similar relations obtain among phenomena of both orders, the science of those relations is the same. Logic, then, can only be described as to its matter by calling it a Science of universal matter-of-fact,—I know no short name for it: Realistic and all cognate words are excluded by historical considerations,—but this is a clumsy expression, and it is better to describe it according to its form. Logic is an Abstract Science; and the absence of any other generic name for Logic is a reason for confining the name, Abstract, as Mr. Spencer does, to Logic and Mathematics. For, of course, Mathematics, like Logic, is neither an objective nor a subjective Science, but indifferent to this distinction. For in as much as quantitative relations of Number, Intension, Protension (subjective Exten-

very inadequate definit'l.

* Principles of Psychology, § 53.

sion, though it exists, is too indefinite to be measurable) occur among subjective phenomena, Mathematics treats of them, at the same time with similar relations in the Object.

4. *Position of Logic among the Sciences.*

With the qualifications above indicated, the position of Logic among the Sciences appears to be that which has been assigned to it by Mr. Spencer. And indeed so far as (with only a superficial knowledge of most Sciences) I may presume to judge, the whole classification of the Sciences given by him seems to me just and admirable. But it is a pity that in that classification the place of Subjective Psychology is not expressly marked; and so I propose, by recasting the general Table given in the *Classification of the Sciences*, p. 12,* both to find a place for that Science, and to show the place of the Abstract Sciences as conceived in this Essay. Thus it will be seen how the Abstract are the only universal Sciences.

SCIENCE.

<table>
<tr><td colspan="2">Abstract, dealing with Relations in general, whether their Terms be
Objective, or Subjective.</td></tr>
<tr><td>Abstract-Concrete, treating of phenomena in their elements.</td><td rowspan="2">Introspective Psychology.</td></tr>
<tr><td>Concrete, treating of phenomena in their totalities.</td></tr>
</table>

* Spencer, Essays, vol. iii.

In this classification there is still no place for Metaphysics, or First Philosophy, and there seem to be reasons why Metaphysics cannot be classed among Sciences. 1. Since no accepted body of doctrine yet exists which can be called Metaphysics, we cannot be sure whether such a body of doctrine, if ever it should exist, would have sufficient unity to be called a Science. 2. It is probable that Metaphysics will never be a body of dogmas, as the Sciences are, but rather a place of criticisms. I hardly expect indeed that it will ever be a Science at all, as Mr. Lewes does; though I hope that by some such method as he has elucidated,* we may one day have a criticism of Axioms and instinctive beliefs, to which most well-formed minds will be able to assent: such a criticism rendered as systematic as possible might be aptly called Metaphysics; and so that wandering word find rest at last. That there should be a special place for such criticism, instead of leaving to the several Sciences the criticism of their own Axioms, is very desirable. For the mental attitudes of Science and Criticism are strongly contrasted, and the aptitudes for them are very different. Moreover it seems that the chief focus of Metaphysical criticism is the union or mutual implication of Object and Subject: whereas the special Sciences assume the differentiation of Object and Subject; except the Abstract Sciences, and these

* Problems of Life and Mind, Introduction, Part I. ch. iii.

I think this view of Meta: a very good one.

merely neglect it. And the existence of a competent Metaphysics of this nature would be a great relief to the special Sciences; particularly to Psychology, and to Logic, as we shall more than once have occasion to notice.

I understand a discussion to be critical, when the question stated does not admit of a complete solution, and the possibility of a solution is inquired into, or an approximate solution is sought by investigating the origin of the question, and of the rival solutions of it, besides balancing the arguments for the rival solutions. Kant's *Transcendental Dialectic*, appears to me to furnish a better model for a system of Metaphysics than any other work I am acquainted with.

The Classification of the Sciences would itself, I suppose, be an outlying topic of Metaphysics, or First Philosophy.

5. *Redistribution of the Contents of Scholastic Logic.*

We have seen how heterogeneous were the contents of the Scholastic Logic: including the Science of the use of language in Reasoning; the Theory of Reasoning itself; occasional discussions in Metaphysics; and expressly or by implication, some of the most general laws of the correlation of phenomena. These ingredients we have to redistribute: and, first, only the last named portion of Scholastic Logic was really Logical. As for the metaphysical discussions:

pending the constitution and general acceptance of some body of metaphysical criticism, its questions must be dealt with to some extent in the special sciences, wherever intelligence requires it. The Theory of Reasoning is of course absorbed by Psychology. And the Science of the use of language in Reasoning, I propose to cede to Rhetoric.

For, surely, it is anomalous that there should be one Science which treats of the use of language in discourse generally; whilst the use of language in a particular kind of discourse, and that the most important, is dealt with in another Science. If Logic deals with the use of language in reasoning; of what does Rhetoric treat? Is it conversant with the use of language in obfuscation? I fear it is commonly thought so. I believe an impression prevails, that if you wish to state your case plainly and fairly, and avoid misleading yourself and others, you may perhaps derive some assistance from Logic; but that if you want to overcolour your facts, and make the worse appear the better reason, you had better apply your mind to the study of Rhetoric. Rhetoric, in short, according to this view, is the art of so using language as to "minify the great and magnify the little." The prevalence of such notions explains the neglect of Rhetoric in modern times, and why so few influential minds have given it their attention. It was impossible that such notions should not arise, while the use of language as the

act. of. onfusing.

revolut involved in giving new office to Rhetoric distinct
ordinary that wd lead to much difficulty & confusion.

vehicle of truth was discussed by another Science. It was impossible that the modern nations, so anxious about truth, as to develop the experimental Sciences, should bestow much thought upon a study which, at best, appeared to aim at nothing better than ornamentation. So long as it bears that appearance, Rhetoric can never prosper: language is the instrument of truth, as the epigram to the contrary bears witness; and truth brooks no rival interest. But I see no reason why care, accuracy, and elegance in the use of language should not be united in one discipline. Professor Bain * in his *English Composition and Rhetoric*, under Exposition and Persuasion, expounds some parts of the Scholastic Logic: why should it not all be expounded there, so far as it is concerned with Names, Propositions, and Arguments? By giving to Rhetoric such a core of necessary matter, it would certainly be rescued from neglect; and the remainder of its substance, serviceable to beauty and perfection, would secure the regards of many more students; who must be edified accordingly.

By being entangled with Logic, a hardier Science, Rhetoric has been robbed of its own, and stunted in its growth; if given more room, it may perhaps flourish again. But it is not a Science that can be

* Cf. Whately: Rhetoric; Part I. c. ii. Campbell: Rhetoric; Bk. I. cc. iv—vi. The close affinity of the first Book of Aristotle's Rhetoric to Logic is also obvious.

altogether separated from others; it is not a fundamental Science. Language is a mediator between thought and fact, and the science of the use of language must depend upon Psychology and Logic. Upon the principles of Logic will depend, for instance, all that part of Scholastic Logic, which we propose to cede to Rhetoric. The principles of Consistency, which belong to Rhetoric, represent certain aspects of the constancy of nature, which are laws of Logic: were nature inconsistent (so to speak) we should be under no obligation not to be so; since inconsistent statements might then both be true. The import of Names and Propositions, the processes of Obversion, Conversion, &c., as concerned with language, are all explained by reference to corresponding logical principles, which will appear in subsequent chapters.

6. *Fallacies.*

Logic, as I try to regard it, has little or nothing to do with Fallacies. It is no doubt quite possible to commit Fallacies in expounding Logic, or in interpreting the exposition; but in the actual correlations of phenomena, in matter-of-fact, there can lurk no Fallacies. Fallacy is a kind of Error; it is incident to the correspondence of Subject and Object, and arises when that correspondence is imperfect. The proper place to treat of Fallacies,

therefore, would seem to be the Science which investigates the means of furthering the correspondence, that is, the Science of Education, especially of the Intellect. There at least what Prof. Bain calls the "fallacious tendencies of the mind," would be most suitably corrected. But by far the greater portion of what are usually called Fallacies, must be handed over to Rhetoric. To Rhetoric naturally belong all Fallacies occasioned by the use of language, whether in private meditation, or in the communication of ideas; and whether the misrepresentation which essentially constitutes the Fallacy, prevail in the mind of the thinker himself, or be one which he wishes to make prevail in the minds of those whom he addresses. Thus the Table of Fallacies in Whately's Logic might be transferred whole to a treatise on Rhetoric. Indeed many Fallacies,—all those which may be called devices of sophistry,—are plainly such as ought never to have been mentioned in Logic. *Petitio principii*, *ignoratio elenchi*, *argumentum ad hominem*, &c.; these are tricks of the hustings; and to treat of them in Logic shows with what an arrogant and grasping spirit the Logician has invaded the province of Rhetoric.

7. *The Logical Calculus.*

In this Essay everything proceeds, somewhat as in Euclid, by a comparison of intuitions, and I only

need mention once or twice, in passing, the systems of Logical calculation, developed by Boole, Prof. Jevons, &c. Not that I underrate the advantages of a Calculus: probably by its means conclusions may be reached, which few, or no one could prove without it; and certainly, once mastered, it saves effort even in less complicated and protracted trains of reasoning. Still it is not the Science of Logic, but a machinery constructed on Logical principles, and related to Logic, as the Rules of Arithmetic are related to the Science of Number. And it would be a great mistake, I think, to substitute a drill in the Calculus, for an explanation of the Science, as a means of Education. For in using the Calculus we lose to a great extent that discipline of the power of abstract intuition, which is the great benefit of Logical studies. It would be sad indeed if the study of Logic should sink into that state in which the study of elementary Mathematics still almost everywhere grovels: there are at this moment half a million children in the country, having rules and formulæ drummed and brayed into their ears, unmitigated by one note of Science. But of this there is little danger.

8. *Acknowledgments.*

In the foregoing pages, I have noticed certain opinions of Mill, Prof. Bain, and Mr. Spencer, in order to point out how I differed from them: it was

necessary to distinguish their views from my own, because they are the writers with whom I feel myself in closest agreement. And I now hasten to add, that if there is anything of value in the ensuing pages, it is probably derived from their works. The idea of the whole and the substance of parts, are derived chiefly from Mr. Spencer; most of the remainder is founded on the writings of Prof. Bain and Mill. As to quotations and references, when I might have used either Prof. Bain or Mill, I have generally preferred the work of Prof. Bain, in as much as he has made several improvements in the modes of statement adopted by his great forerunner. After writing the last chapter, I found that De Morgan in his *First Notions of Logic* had anticipated to a great extent my treatment of the Syllogism, or Mediate Relation of Classes; and I was able to make some improvements from hints supplied by him. Lesser obligations will be acknowledged as they occur.

Does not H. S. here treat T: & S: as independent existences.

CHAPTER II.

OF RELATIONS.

1. *Definition of Logic.*

LOGIC has been defined by Mr. Spencer as "an Abstract Science, treating of the Laws of Relations that are qualitative; or that are specified in their natures as relations of coincidence or proximity in Time and Space, but not necessarily in their terms: the nature and amount of which are indifferent." *

And this definition with two slight qualifications I am willing to accept: first, Logic cannot altogether ignore Relations that are quantitative; secondly, besides Relations of Contiguity in Time and Space, those of Likeness and Unlikeness must continually be considered. The Likeness and Unlikeness of Terms lies at the foundation of the Logic of Classes; which was nearly the whole of the Scholastic Logic: as Mr. Spencer has elsewhere described it—"a science of the relations implied in the inclusions, exclusions, and overlapping of classes." *

* Classification of the Sciences, Table I.

† Study of Sociology, ch. ix.

2. *Of Relations in General.*

A Relation cannot be defined, for we know of nothing more elementary. The only way of bringing it to light is by contrasting it with its co-ordinate abstraction, the Term. Every Relation lies between, or connects, or ties two Terms, and no more. All Terms are connected and tied by Relations. We may be helped to realize these notions by the figure of two balls tied together with a string.

The world consists of related Terms or terminated Relations. This seems to be the end of all analysis, whether of the Object or Subject.*

The ultimate modes† of Relation are

1. Likeness and Unlikeness.
2. Succession and Nonsuccession.
3. Coexistence and Noncoexistence.

And it must be observed that although in each of these couples, one name has a negative prefix, the Relation signified thereby is not less real than the other. Negation is an artifice of language: in nature there is only contrast and incompatibility.‡ Likeness has only a single contrast, Unlikeness: but Succession

* Bain: Logic, Appendix C.

† Bain: Logic, Appendix C; and Bk. I. ch. iii. § 16, 17.

‡ Kant: Versuch den Begriff der Negativen Grössen &c. Bain: Logic, Bk. I. ch. i. § 12.

is contrasted indefinitely with Nonsuccession, definitely with Coexistence; and Coexistence is contrasted indefinitely with Noncoexistence, definitely with Succession.* Likeness precedes Succession and Coexistence in the order of exposition because it is involved in them; for they are Unlikeness and Likeness with respect to Time. And Succession precedes Coexistence, because it is simpler, and according to Psychological Theory, prior in experience; and because we shall find that coexistences often result from successions (Causation), but we have not to notice any cases in which succession results merely from coexistence.

If we call Likeness, Coexistence, and Succession, Positive; Unlikeness, Noncoexistence, and Nonsuccession, may be called Counter Relations.

3. *Of Relations of Likeness and Unlikeness.*

The Likeness and Unlikeness of phenomena is the fundamental fact of nature. From the Cosmological point of view, that phenomena are alike and unlike is the reason why identification and discrimination are the ultimate faculties of mind: from the Psychological point of view, they are two expressions of the same fact. Ultimate Relations themselves are alike and unlike; else they could not be classified as above.

* Spencer: Psychology, Part VI. ch. viii.

But Likeness and Unlikeness prevail amongst phenomena in various degrees, from the vaguest and most superficial resemblances and contrasts to exact Likeness and Unlikeness with respect to Quantity. Relations of Likeness and Unlikeness are thus either

1. Quantitative, or
2. Qualitative.

The Quantitative division, comprising Relations of Equality and Inequality of amount in respect of Number, Intensity, Time, Space,—is the matter of Mathematics.* And several recent works on Logic have given some account of the methods of Mathematics: but no such task falls within the design of the present Essay; which aims hardly at all at being practical, but mainly at pure Science; treats not of how Relations are dealt with, but of Relations themselves; and therefore, since Quantitative Relations are treated of in Mathematics, so far as possible only of Qualitative Relations: though some of the discussions are so abstract as to be almost equally applicable to Relations of both orders. For indeed it is obvious that, if there are any truths concerning Relations in general, they must be common to Logic and Mathematics; being the contents of that generic Abstract Science of which these sciences are co-ordinate species.

What Science i this ?

The Qualitative division of Relations comprises

* Spencer: Classification of the Sciences, Table I. &c.

Relations of Likeness and Unlikeness in respect of Quality merely, or Nature; of Likeness and Unlikeness in respect of Time, that is, Simultaneity and Succession; and Likeness in Time, with adjacency in Space vaguely implied, or Coexistence; with the indefinite Relations of Nonsuccession and Noncoexistence. But I must add that when Relations of Succession and Coexistence are definitely measured, they become subject to Mathematical rather than Logical treatment. Strictly, it is only when Succession and Coexistence are considered as such and apart from measurement of Time and Space, that they belong to Logic. For Mathematical treatment, on account of its greater definiteness and immense resources, has the preference whenever applicable.

Merely Qualitative Relations of Likeness and Unlikeness may again be generally distinguished from one another, as

1. Definite, or
2. Indefinite.

It is with Definite Likeness or Unlikeness that Logic has to do; since it is only so far as these Relations are definite, that Laws of phenomena can be established: wherefore, too, it is with such Relations that Reason is conversant; since only so far as there are Laws can there be safe inferences. Indefinite Likeness and Unlikeness, on the other hand, belong to

Equality in Math: Props. A = B means the quantity represented by A is equivalent to the " " by B
" in Logical " " A = B means the content or quality of A is equivalent to the content of B.

20 = (12 + 8)

Fancy, and often furnish matter to poetry and wit; as when the "flying fiend" is compared with a fleet of ships, or a cloud is said to be like a weasel, or like a whale. But such vague and transitory resemblances afford no footing to Science.

The most definite Relations of Qualitative Likeness may sometimes be called Equal; though there is a tendency to confine that name to Quantitative Relations.

4. *Of Relations of Succession.*

Relations of Succession are either

1. Inconstant, or
2. Constant.

An eclipse of the sun may or may not be followed by a disastrous battle; it is always followed by darkness upon earth: the former Succession of events is classed as Incoherent or Inconstant, the latter as Coherent or Constant. In the infinite movement of the world from moment to moment, the Incoherent Successions are of course incalculably more numerous than the Coherent; since all events of the second moment follow each event of the first; while on the recurrence of any event of the first moment, only one or a few events of the second moment would recur. But Coherent Successions afford most scope for Science, or generalized knowledge, and are those which are chiefly treated of in Logic.

Constant Successions are said to involve Causation, and this may happen either directly or indirectly. A Relation of Direct Causation is called a Relation of Cause and Effect; such is the Relation between sunrise and daylight upon earth.

A Coherent Succession by Indirect Causation may obtain, or seem to obtain, between two Part-Effects of a single Cause; as between day and night over the same hemisphere,—the Joint-Effect of a planet's rotation in the sunshine. This indeed may be viewed as two Effects of the continued action of a Cause; and it must be admitted that an unexceptionable example of this Relation is hard to find. The flash and report of a gun seem to make a case in point; but here distance of the observer is a condition of the succession of the Part-Effects. The difficult subject of Causation will be discussed at greater length in Chapter VI., and all relevant remarks elsewhere, I should wish to be interpreted in the sense of fuller discussion.

A Coherent Succession by Indirect Causation may be called a Relation of Coeffectionally Coherent Succession. A Coherent Succession by Direct Causation may be called a Relation of Efficiently Coherent Succession, or a Relation of Efficient Coherence, or simply a Causal Relation; and a series of events so related may be called a Causal Series.

Amongst Causal Series, again, we may distinguish from the others, those which consist of several events

that happen again and again in a very similar order.* Such repetitive Series make up the lives of plants and animals: they may be called Cyclical; all other Causal Series, Acyclical. It is possible that all Causal Series are in the long run Cyclical: this is the famous speculation that in the infinite lapse of Time the World repeats itself. But it is enough if the above distinction be real in experience.

The indefiniteness of Relations of Nonsuccession prevents their being similarly classified: they can only be contrasted with each and every sort of Succession.

5. *Of Relations of Coexistence.*

Relations of Coexistence, like Relations of Succession, are either

1. Inconstant, or
2. Constant.

Inconstant or Incoherent Coexistence is the Relation of all things in the world to one another at any moment of the world, in so far as they cannot be expected to recur continually in the same Relation. Thus, a book on the table, and a tree in the garden, though not without a certain Coherence in the system of the World, would usually be said to stand to one another in a Relation of Incoherent Coexistence.

* Bain: Mental Science, Bk. II. ch. i. § 46.

Such Relations are only within narrow limits a subject of Science, or generalized knowledge; though to deal with them (as by measurement) may be part of the object of Applied Science. They will, of course, not be confounded with Relations of Position in the abstract which belong to Geometry.

Constant Coexistence is the Relation of entities at any moment, in so far as they, or similar entities, may be expected to recur continually in the same Relation.

Constant Coexistence is either

1. Coeffectional, or
2. Specific.

Coeffectional Coherent Coexistence is the Relation of coexistent Part-Effects of the same Cause: such is the Coexistence of night and day over opposite hemispheres of the earth. And possibly all Coherent Coexistence is ultimately Coeffectional.

Specifically-coherent Coexistence is the Relation of qualities or parts in a member of a Natural Kind. It is either

1. Essential, or
2. Integral.

Essentially Coherent Coexistence is the Relationship of qualities in a substantial group, as of the colour, specific-gravity, &c., of gold. And Essential Coexistence does not involve Relations of Position,

since qualities appear to subsist in mutual inter-fusion. Hence the formula of the Logical Calculus,*

$$ABC = ACB = BCA = \&c.$$

Integrally Coherent Coexistence is the Relationship of separable parts of a whole, as of elementary substances in a chemical compound, or of members in an organized body. Integral Coexistence is ultimately reducible to Essential Coexistence together with Relations of Position.

The Coexistence of motions or events may be called Simultaneity.

As with Relations of Nonsuccession, the indefiniteness of Relations of Noncoexistence, or Nonsimultaneity renders it impossible to classify them; but they are contrasted with each and every sort of Coexistence and Simultaneity.

* Jevon's Principles of Science, vol. i. p. 41 (1st ed.)

6. *Table of Relations.*

- Likeness and Unlikeness.
  - in Quantity
    - Equality.
    - Inequality.
  - In Quality
    - Quality merely
      - Connature.
      - Nonconnature.
    - In Time
      - Succession and Non-succession
        - Inconstant.
        - Constant
          - Coeffectional.
          - Efficient
            - Acyclical
            - Cyclical.
      - Simultaneity, Nonsimultaneity, and (space sometimes vaguely implied) Coexistence and Noncoexistence.
        - Inconstant
        - Constant
          - Coeffectional.
          - Specific
            - Essential.
            - Integral.

CHAPTER III.

OF TERMS.

1. *Of Terms in General.*

THE Term can be defined no more than the Relation. In trying to elucidate the notion of Relationality we have already done what we can to elucidate the notion of Terminality. Terms are contrasted with Relations as being entities related. All Terms are tied together in couples by Relations. A Relation of two Terms seems to be the unit of existence. No Term without a fellow: no pair of Terms without a Relation: no Relation without two Terms: no Relation with more than two Terms. But every Term enters into many Relations: is indeed related in some way to every other Term.

Terms are either—

1. Simple, or
2. Compound.

And simple Terms are either—

1. Feelings, or
2. Relations.

Within our present consciousness Feelings are ultimate Terms, although there is a Psychological hypothesis* that no known Feeling is really a simple or ultimate experience. Feelings being related, a Relation of two Feelings may be itself related to another Relation of two Feelings; as when the Coexistence of two qualities in one animal is like the Coexistence of similar qualities in another animal of the same kind: hence Relations may themselves be Terms and may then be called Terminal Relations.

2. *Of Feelings as Terms.*

How Feelings are Terms hardly needs pointing out. One Feeling of warmth is like another Feeling of warmth, and unlike a sound. Certain combinations of sound are simultaneous with, or succeeded by, a sense of pain: and so on.

fr: Mr. W's lectures.

Pure Feelings, as such, belong to the Subject: but Feelings regarded as in Essentially Coherent Coexistence with other Feelings are called Qualities; and, as Qualities, they are either Subjective or Objective.

3. *Feelings as Qualities.*

It is as Qualities that Feelings are most important in Logic, and especially as Qualities of the Object;

* Spencer: Psychology, Part II. ch. i.

for although many theorems of Logic hold good of the Subject, it is in the greater definiteness and coherence of the Object that they are best studied.

Since Feelings are Terms, of course Qualities are; for Qualities are only Feelings that terminate particular Relations. To terminate Relations of Essential Coexistence is the nature of Qualities. They may also be related by Coherent Succession, as when in melting ice, the qualities of a liquid succeed those of a solid: and they may be like or unlike, as with colour in snow and May-blossoms, or in snow and poppies.

4. *Of Relations as Terms.*

Relations themselves may be Terms of all kinds of Relations: indeed all Relations are Terms. That Relations may terminate Relations of Likeness and Unlikeness, that is, may be like or unlike one another and unlike Terms, is implied in their classification among themselves, and in distinction from Terms. Relations are alike in their Relationality and unlike Terms: Relations of Likeness are alike, and unlike Relations of Unlikeness, Succession, and Coexistence; and so on.

Similarly all kinds of Relations may terminate Relations of Succession, and do so when they are implicated in Causal Series. Take a billiard-ball rolling about upon the table. At three successive

moments, if we make the moments short enough, the motion of the ball in the first moment is like (or imperceptibly unlike) its motion in the second; and its motion in the second moment is like its motion in the third: thus two Relations of Likeness succeed one another. And since these Relations of Likeness coincide with Relations of Succession, the Relations of Succession likewise succeed one another. At the same time the motion of the ball is being converted into vibrations, which coeffectionally coexist; and these coexistent vibrations from moment to moment succeed one another.

And all kinds of Relations may terminate Relations of Coexistence, and are commonly implicated in Specific Coexistence. In the organization of an animal, in so far as it is symmetrical, we have the Coexistence of Relations of Likeness: many changes, too, involving Relations of Succession, go on simultaneously, or coexist, in corresponding members as the effects of common causes: and Relations of the Integral Coexistence of parts constantly coexist with Essential Coexistence of qualities.

Lastly, Relations of Succession may coexist with Relations of Coexistence; and the Relations of Coexistence thus arising between Relations of Succession and Coexistence, may again be related by Coherent Succession. Thus, whilst ice is melting, there are changes of consistency and specific-gravity, which coexist with the coexistence of unaltered

weight and chemical constitution; and as the process of melting continues, moment by moment such coexistent Relations of Relations coherently succeed one another.

Further complexities of Relationality the reader will follow out for himself.

5. *Of Compound Terms.*

A Compound Term is a definite Group of Qualities; and such a Group may occur in the Subject as an Idea, or in the Object as a Thing or Event: but it is better studied in the Object. To be treated as Terms such Groups of Qualities must have some coherence; and for Logical purposes they may perhaps be best classified according to those Relations of their parts which give them coherence. And since Relations of Likeness do not give coherence to Terms, we have only to consider how Terms may subsist by the coherence of Qualities in Succession, or Coexistence, or both.

1. As to Succession. We may suppose a Compound Term to consist of two Simple Terms related as Cause and Effect: but such a case is unexampled; for Simple Terms are abstractions, and Causation is of the concrete. True, a Relation of Cause and Effect is sometimes said to be a Relation of two events or changes; and a change is itself a Relation of Succession, which if not compounded is a Simple Term.

But in the first place, a Relation of change is in reality always compound; and moreover a succession of two changes is not the whole Relation of Cause and Effect, as we shall see in Chapter VI.

2. As to Coexistence. We may suppose a Compound Term to subsist by the Coexistence of Simple Qualities: and such are most of the concrete phenomena of the Inorganic World. A piece of iron, a stone, a house—these are instances of Groups of Qualities cohering by Coexistence. Such we may call Substances. The type of this simplest kind of Compound Term is a chemical element: a house is an outlying example.

3. Are there any Compound Terms whose integrity depends on both Succession and Coexistence? Plainly there are: the qualities and parts of an organized body are interrelated both by Succession and Coexistence: its coherently coexistent qualities at one stage of growth are coherently succeeded at another stage of growth by other qualities also coherently coexisting.

But hitherto we have only considered the general Relations of constant Succession and Coexistence: how far may this classification be extended by taking account of more special modes of Relation? First, are any sub-classes of Compound Terms subsisting by Coexistence, to be distinguished according as the constitutive Relation is Coeffectional, Integral, or Essential?

i. We shall see in Chapter VI. that it is an aim of Science to show that all Coherent Coexistence is Coeffectional, but certainly this cannot at present be accomplished. Mixed Relations of Simple Coexistence and Coeffection are perhaps the commonest, as far as our knowledge reaches; and therefore we make no subdivision at this point. And, though obvious, it may be worth observing that Coeffectional Relations of Coexistence, obtaining amongst the parts or qualities of a Substance, do not introduce into it any Relation of Succession; for though they savour of Causation the Efficient Relation itself is not involved in them. If, for instance, the Relations of the qualities of gold among themselves were shown to be Coeffectional, that would not introduce a Relation of Succession among those qualities; but would only prove them to be small part-effects of some vast and ancient case of Causation.

ii. Nor do we subdivide the class of Compound Terms dependent on Coexistence, on account of Integral Relationship. For, in the first place, all Compound Terms (with the hypothetical exception of physically simple atoms) involve both Integral and Essential Relations. And, secondly, as before remarked, Integral Parts are themselves resolvable into Essential Coexistence of Qualities with Relations of Position.

Secondly, how are Compound Terms, subsisting

by both Succession and Coexistence, affected by the constitutive Relations of Succession being Coeffectional, Acyclical, or Cylical?

i. Coeffectional Relations of Succession, when known to be such, are of subordinate importance in comparison with the Efficient Relations in which they are involved; and hence establish no independent Terms.

ii. Relations of Acyclical Succession, however, may be regarded as giving coherence to, and establishing, independent Compound Terms. In every case of Cause and Effect, the set of coexisting circumstances making up the Cause, and the set of coexisting circumstances making up the Effect, are bound together by the Efficient Relation into a complex whole, which we may name a Causal Instance.

iii. And Relations of Cyclical Succession among Coherent Coexistences, also establish Compound Terms; namely, organised bodies, which we have already described as subsisting by both Succession and Coexistence: and these we may call Individuals. But the name Individual cannot be consistently confined to organic bodies; we must extend it to all bodies that exhibit a cycle of evolution; as, for instance, a planet.

We find then that there is only one kind of Compound Terms, subsisting chiefly by Coexistence, namely, Substances; but two kinds subsisting by

both Coexistence and Succession, namely, Causal Instances and Individuals. Both Causal Instances and Individuals involve Causation: but in the former case it is Acyclical, occurring as an incident in the general weaving of Nature, and liable to be dissipated in ever new directions according to circumstances; in the latter it is Cyclical, caught (as it were) in a vortex, and revolved in a crowd of similar cases, through approximately similar changes in similar times. Both involve Coexistence: but the Coexistence involved in Causal Instances, though partly Essential, since Causation is of the concrete, needs not be Coherent throughout, but generally involves the concurrence of separable circumstances; whereas the Coexistence involved in the nature of Individuals is throughout Integral and Essential, and indeed in their case the coherence due to Coexistence is liable to be mistaken for the whole.

6. *Compound Terms in their Relations.*

Compound Terms in Relations of Succession and Coexistence present Logic with no new phenomena. A Coherent Succession of Substances would be resolvable into Substances and Causation; a Coherent Succession of Causal Instances only yields more Causal Instances; the Causation or Succession of Individuals by generation only produces more Individuals. Similarly, the Coexistence of Substances

is a more compound Substance; the Coexistence of Causal Instances is a more complicated Causal Instance.

But as the Likeness and Unlikeness of Terms in general is the fact that gives existence to Classes, so the Likeness and Unlikeness of Compound Terms gives rise to those Classes which are based upon many Attributes; and these phenomena furnish Logic with some of its most important matter. Four of the remaining chapters of this Essay will be entirely occupied with the consideration of Classes; and it is Classes of Compound Terms which require most consideration.

And I may here observe that Compound Terms are tied with Compound Relations. A Relation of two Groups of Qualities is not a single Relation, nor a coincidence* of single Relations, but manifold, according to the multitude of the Qualities which constitute the terminal Groups. Compound Terms, in fact, are not tied together with a thread, but with a hawser made of many threads. And if for convenience we sometimes speak of such Terms and Relations as wholes, we always reserve the right to decompose them into their elements whenever intelligence requires it. We shall find, for instance, that, in respect of some qualities, a Compound Term may be related to others by Likeness; but, in respect of other qualities, to the same Terms by Unlikeness.

* Cf. ch. iv. § 4.

7. *Table of Terms.*

We may again give the results of the Chapter in the form of a Table.

- Terms
  - Simple
    - Feelings or Qualities.
    - Relations.
  - Compound
    - Substances.
    - Causal Instances.
    - Individuals.

N. B.

CHAPTER IV.

OF THE IMMEDIATE AND MEDIATE RELATIONSHIP OF SINGLE TERMS, &c.

PART I.

IMMEDIATE RELATIONSHIP OF SINGLE TERMS.

1. *Of Identity and Sameness.*

WE must try to distinguish between Identity, Sameness and Similarity. All these Relations are species of Likeness. Identity (generally) and Sameness both differ from Similarity in this, that they carry Likeness to the degree of indistinguishableness; whereas in Similarity there is still some perceptible Unlikeness. Sameness is exact Likeness, which may be either of Quality, Quantity (Equality), or Position. And where these three modes of Sameness, together with Continuous Existence, unite in one entity (in which case the time of its existence is not marked by any perceivable changes in the entity itself) here we predicate Identity.

However, this is only the most perfect Identity, and rarely or never to be met with. Many entities,

especially the more Compound Terms, are (as we shall see) called identical notwithstanding alterations of both Quantity and Quality. And changes of Position are admissible in an identical thing, if they are such as may be rationally accounted for. But changes of Quantity and Quality in a thing considered as identical are usually slow, and leave to it its indistinguishableness from moment to moment; and all its changes must be according to Nature, and such that its Continuous Existence as a possible object of unbroken observation remains inferable: whence Hume says that Identity depends upon Causation;* and Locke, that an identical thing can have but one beginning.†

Sameness is, indeed, often made synonymous with Identity; but it is as often confounded with Similarity: so that it may be a gain to both the fulness and precision of our vocabulary if we discriminate all the three.

A Feeling has, strictly speaking, no Identity, for it has no Position; or if it be called identical so long as it persists in consciousness without change or interruption (which, on account of the intermittent nature of consciousness, cannot be very long) this is by courtesy, for Existence expresses the whole fact; or we may call it Subjective Identity. A Feeling revived without perceptible change might perhaps be called

* Treatise of Human Nature: B. I. P. III. § 2.

† Essay of Human Understanding: B. II. c. 27, § 1.

the same as that before experienced; but the dimness and indefiniteness of the Subject makes comparison difficult, and we can seldom be sure of more than Similarity.

Feelings, viewed as Qualities of the Object, and thus acquiring Position, are spoken of as persistently the same although absent from consciousness, being regarded as "permanent possibilities" of experience; and these Qualities when again realized in consciousness are, if we believe in their latent Continuity, said to be identical with what we before experienced: this we may call Objective Identity. And as to Sameness, I conceive, that if two Qualities are not distinguishable in themselves, but only in their relations to other Qualities, we may call them the same; though certainly not identical. Thus the colour of two pieces of silver, though not identical, I should call the same, and not merely similar.

The Identity of a Relation, like that of other Simple Terms, depends on persistent Sameness; but also on the Identity of its Terms severally; for an identical Relation can tie only two Terms. A Relation is Subjective or Objective according to the nature of its Terms; and its Identity will be estimated accordingly. And if its Terms be one of them Objective and the other Subjective, as in the Likeness between an idea and an object, the nature of the Relation, I conceive, follows the weaker, or Subjective, Term. Thus the Likeness of one shilling to

another, is not identical with the Likeness of the first shilling to a third, but only the same. And since the nature of Subject-Object Relations follows the weaker part, the Likeness of my present idea of the church-steeple to that object, is not identical with the Likeness to that object which my idea of it may bear to-morrow, but only similar to it; for though I attribute Identity to the object, I cannot to the idea in nearly so perfect a way; and therefore since there are virtually three Terms, namely, two ideas and an object, two of them cannot be tied to the third with less than two Relations.

The Identity of Compound Terms, too, depends upon Continuity and Sameness; but here, especially, instead of Sameness, Similarity is often accepted, if the differences are according to Nature. The perfect Identity of a Substance involves the persistent Coexistence of identical parts and qualities. How far a change of state (involving Unlikeness) may be admitted without loss of Identity, is an unsettled question; and to pursue it here would lead us too far. It depends to some extent upon the rank of the qualities undergoing change—whether they be essential or accidental.* Again, two equal quantities of the same Substance, say two sovereigns, most people would not call the same; but, perhaps, it would be better to call them the same, since their qualities are

* Cf. ch. vii. § 11.

the same each with each; though not identical, since as compounds they differ (and have always differed) in Position. However, among concrete objects exact Sameness is rare, and at most we can only estimate it within the limits of observation.

A Causal Instance can have Identity only by Position, and in the briefest way from moment to moment; for it is the nature of a Causal Instance to be transitory. A similar question regards the Unity of a Causal Instance: the Efficient Relations which are open to observation are always more or less compound. Shall we say that all that has been done upon the earth by sunshine from the beginning is due to one Cause; or shall we limit each Efficient Relation to the transmission of a single ray? We shall see hereafter that the answer to such questions depends, more or less, upon our convenience. Causal Instances may of course be similar to one another to the degree of Sameness.

The Identity of Individuals differs characteristically from that of Substances. A man remains identical, although he loses a limb, or although a certain Coexistence of youth gives place to another Coexistence of age. He only ceases to be identical when not only the Coexistence of qualities has been dissolved, but also the Cyclic Succession of Coexistences has run out or been interrupted. The demand for Sameness in order to Identity seems in such cases to be restricted to the vital organs, and even there is expected

...is seems only to give ~ Identity of a main body.

only within short periods, and not over considerable lapses of time. For the very persistence of an Individual involves a series of changes: hence the elements of Position and Continuity are most important to its Identity. To prove his Identity a man must be able to "account for himself"; that is, to show that he has had from time to time assignable Positions with regard to other persons and things, and in such an order as is consistent with Nature.

2. *Correlatives.*

Two Terms of an Identical Relation are called Correlatives.

3. *Of the Mutual Exclusion of Terms.*

The Mutual Exclusion of Terms is with respect to identical Relations. A Relation has only two ends (so to speak), or ties no more than two Terms. Hence any Term can have only one Correlative or fellow in an identical Relation; or, any two Terms being related in any way, no other Term can enter into that identical Relation; nor can any modification of either Correlative occur without dissolving the Relation; for the identity of a Relation depends upon the identity of its Terms. Wherefore all qualities are regarded as simple, that is, as not folded upon themselves; or else there might be two Terms at one

end of a Relation of Specific Coexistence: but a robin is not twice red upon the breast. Hence the formula of the Logical Calculus*—

$$A = A\,A = A\,A\,A = \&c.$$

Similarly, a Quality excludes all other modes of itself; different colours cannot occupy an identical surface. And (taking explicit notice of Relations of Position) Integral Parts, and Substances are mutually exclusive,—"cannot occupy the same place at the same time."

Mutually exclusive Terms may be called Incompatible. And here I may remark that the notion of negation seems to be an abstraction from the facts of Incompatibility.† The incompatibles of a positive are often many; and as there may be no reason why we should think of one more than of another, we do not think distinctly of any at all: and thus we are apt to suppose that negation is not merely the incompatibility of positives, but the incompatibility of something with all positives. But this something is nothing; and to suppose that nothing can be incompatible with the sum of positives, is to suppose a Relation with only one Term; since 'nothing' cannot be itself a Term. There is not even a relative nothing: much less is an absolute nothing conceivable.

* Jevons' Principles of Science, vol. i, p. 39.

† Cf. Spencer, quoted in Mill on Hamilton, p. 475, 3rd ed.

4. *Comparison of Relations.*

1*st. Symbols.*

The Relations of Classes have long been represented by symbols, and it will be well to have symbols for the Relations of Single Terms. In devising these I endeavour to assimilate the two sets of symbols without confusing them.

Since then the inclusion of one Class by another is represented by A, and Class-inclusion depends on Likeness,

1. Likeness may be represented by α.

For a parallel reason,

2. Unlikeness may be represented by η.
3. Exact Likeness or Sameness may be denoted by the sign of equality, =
4. Coexistence or Simultaneity by ω;

for that looks like Coexistence. And since O is associated with negation,

5. Noncoexistence may be represented by o.

But I can give no reason, except a want of character about *iota*, why,

6. Succession may be best represented by υ (is succeeded by), or ɑ (succeeds).

And, again, because of the association of E with negation,

7. Nonsuccession may be represented by ϵ.

Moreover, since there are certain Relations of qualities in Individuals which may be viewed either as

Succession or Coexistence, and may be called Co-inherence or Concomitance—

8. Concomitance in general may be represented by ωv.
9. Relation in general may be represented by : .

2nd. Coincidence of Relations.

Identity, in so far as it is a persistent Sameness of Quantity and Quality, may be regarded as the Relation of a Term to itself (from moment to moment). The principle of the Mutual Exclusiveness of Terms rests on the facts that a Relation must have two Terms (Identical Terms having the least severality), and cannot have more. Let us go on to consider how an identical pair of Terms may be tied with more than one Relation.

Relations that tie Terms, severally identical, may be said to Coincide: for instance, Relations of Likeness and Integral Coexistence coincide between the two fore-limbs of a quadruped.

3rd. Immediate Implication.

If two Relations be of such a nature that the second *must* always coincide with the first, the first may be said to implicate the second.

Thus, ω implicates ϵ
v ,, o

But in neither case does the converse hold ; for if

$$A \ \epsilon \ (\text{or } o) \ B$$

either A or B may not exist at all.

4*th. Compatibility.*

Relations which *may* coincide are called Compatible :

$$\alpha \text{ and } \eta \text{ are compatible with } \begin{cases} \omega \\ o \\ \upsilon \\ \epsilon \end{cases}$$

$$\epsilon \text{ is compatible with } o.$$

In all these cases the Compatibility is reciprocal.

$$\begin{array}{llll} \epsilon & \text{is compatible} & \text{with} & \omega \\ o & ,, & ,, & \upsilon \end{array}$$

But in these cases the converse Relation of the Relations is, as we have seen, more than Compatibility, namely, Implication.

5*th. Incompatibility.*

Relations that *cannot* coincide may be called Incompatible :

$$\begin{array}{llll} \alpha & \text{is incompatible} & \text{with} & \eta \\ \omega & ,, & ,, & o \\ \upsilon & ,, & ,, & \epsilon \\ \omega & ,, & ,, & \upsilon \end{array}$$

and this Incompatibility is reciprocal.

Hence no more than two positive Relations can coincide, or tie an identical pair of Terms, namely,

a with ω
a with v

And I may add that there is no denial of the Incompatibility of Likeness and Unlikeness involved in speaking of two Compound Terms as both like and unlike. For we saw that Compound Terms are tied with Compound Relations; and the Incompatibility of any two Relations means that they cannot coincide, and not that they cannot be compounded. Compound Terms may very well be alike in some qualities and unlike in others.*

Incompatibility might also be called Obverse Immediate Implication: since a Relation that is incompatible with another, if it obtains, implicates the absence of the other Relation; as Likeness implicates the absence of Unlikeness.

6*th*. *Alteruternity*.

Every Term is related in some way to every other, and that in each kind of Relation: is either Like or Unlike, Successive or Nonsuccessive, Coexistent or Noncoexistent. But in each of these homogeneous pairs the Positive Relation is incompatible with its Counter.

* Cf. chap. iii. § 6.

Such a position, in which of two Relations one *must* obtain and both *cannot*, may be called Alteruternity. Thus

If	α	do	not obtain	η	must
,,	ω	,,	,,	o	,,
,,	υ	,,	,,	ϵ	,,

and conversely.

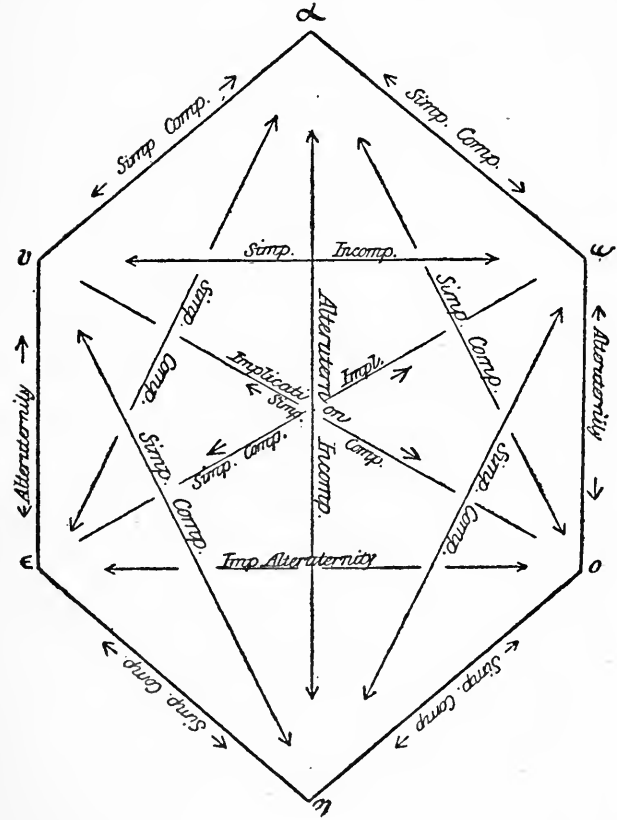
There are other cases where one of two Relations *must* obtain, but both *may* do so; and this may be called Imperfect Alteruternity. Thus

If	ϵ	do	not obtain	o	must
,,	o	,,	,,	ϵ	,,

for	where	ϵ	is not	υ	must be,	and	υ	implicates	o
and	,,	o	,,	ω	,,	,	,,	ω ,,	ϵ

But we have seen that ϵ and o are compatible.

7th. Hexagon of Comparison.



5. *Qualities and Defects.*

Suppose that there exists in Nature a certain sum of possible Qualities or modes of Qualities. They do not all coexist in any one Compound Term, but are

shared amongst Compound Terms. Every Compound Term is a definite conflux of general Qualities:* these it is said to have or possess: the other Qualities, which it has not, may be called its Defects. Every general Quality is either a Quality (Appurtenance) or a Defect of each Compound Term; but cannot be both. Thus Appurtenance and Defection are Alterutern forms of any Quality with respect to any Term.

Since the Defects of one Term are Qualities of another, any Term with as many others as possess all its Defects, may together be called Complementary as to the sum of possible Qualities.

6. *Converse Relationship.*

Two related Terms both enter into their Relationship, but not always both in the same way. In Relations of Likeness, or Coexistence, both Terms are affected alike; but in a Relation of Succession each Term is differently affected. Any Immediate Relation of two Terms may be viewed from both sides: the side of either Term being taken, the Relation thence regarded may be called Direct; and from the other side it will then be said to be viewed in its Converse. These are Equivalent Aspects: the Relationship itself is not affected by our point of view, and therefore we may take whatever point of view we please.

* Bain: Logic, Introduction, § 10, 11.

Perhaps it is not intrinsically more absurd to convert at length the Relations of Single Terms, than the Relations of Classes. However, I gladly avail myself of Mill's ironical statement of this operation,* slightly altering the order of the principles.

1. "When one thing is like (or unlike) another, the other is like or unlike the first."

$$\text{If } A\ a\ B\ ,\ B\ a\ A.$$
$$\text{If } A\ \eta\ B\ ,\ B\ \eta\ A.$$

2. "When one thing is before another, the other is after."

When one thing is after another, the other is before.

$$\text{If } A\ v\ B\ ,\ B\ \alpha\ A$$

For Nonsuccession.

$$\text{If } A\ \epsilon\ B\ ,\ \text{———}$$

3. "When one thing is along with another, the other is along with the first."

$$\text{If } A\ \omega\ B\ ,\ B\ \omega\ A$$

For Noncoexistence.

$$\text{If } A\ o\ B\ ,\ B\ o\ A$$

It will be observed that all Relations allow of Simple Conversion, except Relations of Succession: and these when Positive may be said to be converted by Inversion, as the sign indicates; but when Counter are too indefinite to be converted at all.

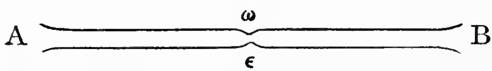
* Examination of Hamilton, c. xxi.

PART II.

MEDIATE RELATIONSHIP OF SINGLE TERMS &C.

1. *Immediate and Mediate Implication.*

In speaking above of the Implication of one Relation by another we touched the constitutive principle of Logic. Logic might be defined as the Science that investigates the most general conditions of the Implication of Relations. The fundamental assumption is, that certain Relations among phenomena involve other Relations; or, that there exist constant Correlations; that is, that certain Relations are themselves constant Correlatives (*ante*, Part 1, § 2): and the question of Logic is, what are these Correlations? One of them we have just met with, namely, Correlation by necessary Coincidence, which may be called Biterminal Correlation; where the Relations compared are conjoined at both ends, or tie an identical pair of Terms. It may be symbolised thus:—



If we call any Relation directly known *explicit;* any Relation not directly known, but implied in explicit Relations, may be called *implicit.* In Biterminal Correlations an explicit and an implicit Rela-

tion coincide; and such Implication may be called Immediate. But there are cases in which a Relation between two Terms is implicated in explicit Relations with which it does not coincide—in Relations which obtain between its own Terms severally, and some other Term or Terms; and such Implication may be called Mediate.

Where there are more than one Relation that do not coincide, there must be more than two Terms. The Mediate Implication of a Relation is at the same time a Mediate Relationship of Terms. The Relation of two Terms to one another may admit the intervention of one other Term or of many; but all cases of Mediate Relationship are reducible to two, which may be called the Units of the Mediate Relationship of Terms, or of the Mediate Implication of Relations.

2. *Units of Mediate Implication.*

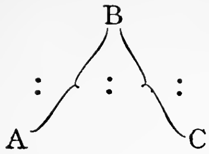
It was formerly supposed that the Unit of all Mediate Implication (in Logic) was a Correlation of three Terms; such as we have in the Axiom, "Things which are equal to the same thing are equal one to another;" and this was also supposed to be exemplified by the Syllogism. An equally important Unit of Mediate Implication has, however, been discovered in a certain Correlation of four Terms. The Units of Mediate Implication may be thus stated:

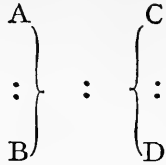
1. Where the Relation of two Terms to one another is implied in the Relations which they severally bear to a third: as if A ω B, and B ω C; we know that A ω C:
2. Where a Relationship between two Terms is implied in the Relations which they severally bear to two other Terms, and in the Relation which these two other Terms bear to one another; as if A a C, and B a D, and A v B, that is taken as evidence that C v D (Causation).

The discovery of these Units of Mediate Relation in their generality is due to Mr. Spencer.* And inasmuch as where there are three Terms the Relations compared have one Term in common, Mr. Spencer in expounding the theory of Reasoning, calls the corresponding intuition one of "*conjoined* relations;" and since where there are four Terms, the Relations compared have no common Term, he calls the corresponding intuition one of "*disjoined* relations." This terminology has well-marked merits; and it is with much diffidence that I propose, for the purposes of Logic, to speak instead of Triterminal and Quadriterminal Correlations.

These two genera of Correlations, regarded as intuitions, Mr. Spencer symbolizes thus:

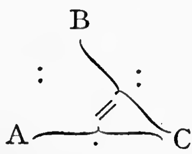
* Spencer's Psychology, Part. VI., ch. viii.





And these symbols admirably represent the conjunct and disjunct character of the Relations compared, and at the same time the Triterminality and Quadriterminality of the several Correlations; but I must venture to alter to some extent for the purposes of this Essay the symbol of Triterminal Correlation.

It will be observed that (as Mr. Spencer writes the two symbols) whereas in the case of Quadriterminal Correlation, the Relations compared are one of them explicit (A : B) and the other implicit (C : D); in the case of Triterminal Correlation, both the Relations compared are represented as explicit (A : B : D). I see no reasons for this, but many why it should be otherwise; and I propose to get rid of the discrepancy by writing the symbol of Triterminal Correlation in such a way as to suggest the comparison of an explicit Relation (B : C) with an implicit Relation (A : C), thus:



Only thus is it made apparent that (except in *à fortiori* Correlations—see below) in both orders of

Correlations, the Relation of the Relations compared is always a Relation of Equality. Moreover this change in the symbol of Triterminal Correlations is, I think, justified by Psychological considerations; and in order to show this I may be excused a brief digression.

3. *Psychological Digression on the Intuition of Conjunct Relations.*

Mr. Spencer has shown how the Quadriterminal Intuition arises,* but has hardly, as it seems to me, been successful in doing as much for the Triterminal;† although the processes are very similar. If, wishing to determine the Relation of A to C, I effect this by means of B, what is the mental process? Suppose that the Relations are of Coexistence: the result of our enquiry may be formulated thus:

$$A \ \omega \ B \ \omega \ C \ .\because. \ A \ \omega \ C.$$

But how did we arrive at this formula, and especially how came we to think of B? It happened, I conceive, as follows: In the first place, prompted by former experiences, we guessed the Relation of A to C: next the Relation of B to C, being similar to that of A to C, was suggested to us by the fact of its likeness. Thus B is brought into view; and if it is proved by examination, or other-

* Psychology, Part VI., ch. viii.
† Psychology, § 286.

wise, to coexist with A, we know that the Time-relations of A and B to any third Term are the same; and since B coexists with C, the anticipated Relation of A to C is confirmed. Thus, in an intuition, it is always a known or explicit and an inferred or implicit Relation that are compared, and never two known Relations. The form in which axioms of Triterminal Correlation are expressed is perhaps misleading: when we read 'Things equal to the same thing are equal,' a comparison of known Relations is at first suggested; but the real comparison of Relations is between the Equality which the two 'things' are inferred to bear to one another, and the known Equality of one of them to a third (known to be equal to the other).

Indeed, it appears to me impossible from a comparison of two Relations to infer a third distinct and different Relation: what mental law does such a process exemplify? If I am told that A coexists with B, and that B does not coexist with C: how do I infer that A does not coexist with C? The course of thought seems to me to be—'A coexisting with B, bears the same Time-relation as B to C, that is, Noncoexistence.' Here we compare not A : B with B : C, but A : C with B : C. Indeed, if we know that A is like B and B like C, it really is not safe to conclude that A is like C; since if the Likeness of A to B and of B to C, be in each case faint, or on account of different qualities, A may be unlike C. We can infer the

Likeness of A to C from their common Likeness to B, only if we have reason to think that the Likeness of A to C is like the Likeness of B to C. Even with *à fortiori* Correlations the case is not really different.

$$A < B < C \therefore (\textit{à fort.})\ A < C$$
$$A\ v\ B\ v\ C \therefore (\textit{à fort.})\ A\ v\ C.$$

For here, although it is true that the Relation $A < C$ is not equal to the Relation $B < C$; still there is a Likeness between the Relations compared, since they are both of them Relations of Inferiority So long indeed as we think only of the Likeness, we miss the *à fortiori* conclusion, and get only as much from the premises as might be got from

$$A = B < C.$$

My impression, however, is that at first we really infer no more than this; and that the *à fortiori* implication is an afterthought,—at least, as a clear and distinct intuition. The course of thought may run thus: $A < C$; for $A : C\ a\ B : C$, and $B < C$; $\therefore A < C$: nay, more, $A < C$ by a still greater Inferiority than $B < C$; for $A < B$.

And similarly with the Correlation of Successions.

It will not be out of place to add a word or two upon the differences between the Intuitions of Conjunct and Disjunct Relations.

Generally a qualitative intuition of Disjunct Relations is more synthetic than a qualitative intuition of Conjunct Relations; that is, there is more inferred in

it. In an intuition of Conjunct Relations of Coexistence or Succession all three Terms are given, and only a Relation is inferred. If, for instance, one argues that the train is late by the station-clock, because it is late by this watch, which keeps time with that clock: we have here three Terms (namely, the train and two time-pieces) given; and all that is inferred is a Relation of Succession between two of them (the arrival of the train and a certain position of the hands on the dial at the station). But in an intuition of Disjunct Relations of Succession or Coexistence, only three Terms are given, and both a Relation and a fourth Term are inferred. If we have had experience of taking chloral and afterwards falling asleep, and now, having again taken chloral, expect presently to fall asleep, there are here three Terms of the intuition given (namely, taking chloral, sleep, and another instance of taking chloral), and one Term (another instance of sleep), together with a Relation of Succession, is inferred.

This distinction, however, holds only between intuitions concerning Coexistence and Succession. In a quantitative intuition of Conjunct Relations, it is possible to infer the third Term: given 3 and 6, we can infer the third proportional. Even where the Relations are of qualitative Likeness, or of qualitative and quantitative Likeness mixed together, we have a similar power: if two dodos were shown us we could imagine a third (and indeed the second

dodo would be of no use but to explain the meaning of Likeness). For given a Term and a Relation of Likeness, a correlative Term is involved in the idea of the Relation. But given a Term and a Relation of Coexistence or Succession; no particular correlative is involved. And therefore the full symbol of Conjunct Relations must probably be written thus (to take an example of Coexistence):

$$\left.\begin{matrix} A \\ \\ \varepsilon \\ \\ B \end{matrix}\right\} \begin{matrix} a \\ \\ = \\ \\ a \end{matrix} \left\{\begin{matrix} C \\ \\ \varepsilon \\ \\ D \end{matrix}\right.$$

for the inference, ω D, is psychologically dependent not only upon the Correlation, $\omega = \omega$; but also upon the Relations,

$$A\ a\ C, \quad B\ a\ D.$$

The inference ω D, is like the imaginary completion of a picture, which we have seen before, and of which a part is now shown us again.

4. *Rule of Triterminal Correlation.*

What now are the most general laws of the Mediate Implication of Relations?

Rule of Triterminal Correlation.

Two Terms homogeneously related to a third, and one of them positively, are related to one another as the other is related to the third.

I call this a Rule rather than an Axiom, for it is too general to be quite self-evident; and moreover (as we shall see) one or two slightly exceptional cases have to be allowed for. The true Axioms are, I conceive, the following special laws of the different orders of fundamental Relations,—laws which embody the above Rule, but can hardly be said to be deductively derived from it: rather is it itself arrived at by generalization from them.

1. Likeness and Sameness.

$$A = B \underset{a}{=} C \therefore A \underset{a}{=} C$$
$$A = B\ \eta\ C \therefore A\ \eta\ C$$
$$A\ \eta\ B\ \eta\ C \therefore \text{———} \qquad \text{(No positive)}$$
$$A\ a\ B \substack{a \\ \eta}\ C \therefore \text{———} \qquad \text{(Too indefinite).}$$

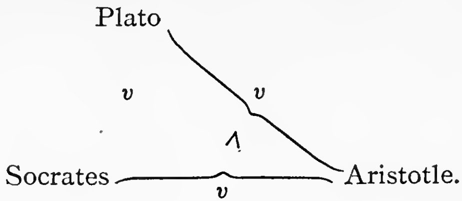
2. Coexistence or Simultaneity.

$$A\ \omega\ B\ \omega\ C \therefore A\ \omega\ C$$
$$A\ \omega\ B\ o\ C \therefore A\ o\ C$$
$$A\ o\ B\ o\ C \therefore \text{———} \qquad \text{(No positive).}$$

3. Succession (ω signifies Simultaneity).

$$A\ v\ B\ v\ C \therefore A\ v\ C \qquad (\textit{à fortiori})$$
$$A\ \omega\ B\ v\ C \therefore A\ v\ C$$
$$A\ \omega\ B\ \epsilon\ C \therefore A\ \epsilon\ C$$
$$A\ v\ B\ \epsilon\ C \therefore \text{———} \qquad \text{(Too indefinite)}$$
$$A\ \epsilon\ B\ \epsilon\ C \therefore \text{———} \qquad \text{(No positive)}$$
$$A\ v\ B\ o\ C \therefore \text{———} \qquad \text{(Too indefinite).}$$

Let us symbolize one of these Correlations with concrete Terms,



In these cases the related Terms should generally be homogeneous;* events comparing with events, and more stable existences with one another according to their kind, whether Simple Terms or Compound: the Relations especially must be homogeneous; since Relations of Time do not compare with Relations of Connature. Hence in comparison with Relations of Succession, ω must mean a Relation of Simultaneity between Terms which are both of them transitory: otherwise, for instance, the Correlation,

$$A \ \omega \ B \ v \ C \ .\!:\!. \ A \ v \ C,$$

where A is perdurable, will not obtain.

And this suggests the observation that Correlations of Coexistence are only certainly true where Coexistence is equivalent to Simultaneity or the Concomitance or Coinherence of Qualities. The Relations,

Thebes ω the Pyramids ω London,

do not implicate

Thebes ω London.

If the Terms are not Coinherent qualities, the middle

* Spencer: Principles of Psychology, Part VI. ch. viii.

Term at least, or that to which both the others are explicitly related, must be an event.

Further it will have been remarked above that some Correlations are rejected as too indefinite; though nothing is said about definiteness in the Rule. The fact is that I do not see how to introduce this limitation: it is not necessary that both the Explicit Relations be definite; since

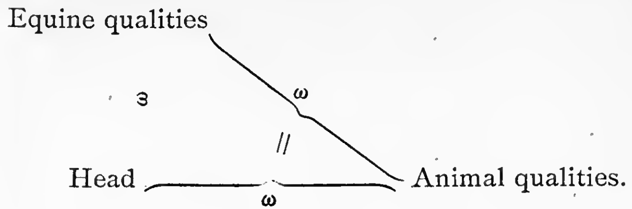
$$A\ \omega\ B\ o\ C$$

is good: nor is it enough that the positive Relation be definite; since

$$A\ v\ B\ o\ C$$

is good for nothing. I merely point out, therefore, that indefiniteness is a circumstance apt to vitiate a Correlation. It is never amiss to remember that the most plausible axiom is an edged-tool to be handled with discretion.

The axioms of Triterminal Correlation generalize the Relations of Single Terms, whether Constant or Inconstant, and of Single Terms only. Quadriterminal Correlation introduces the consideration of Classes. The following case, for example, which De Morgan observed could not be brought under any recognized logical principle—Because a horse is an animal, the head of a horse is the head an animal —is a Triterminal Correlation of Coexistences:



For this argument is only concerned with the coexistence of Single Terms in an individual. But should one argue—This horse (of which I only see the hind quarters) must have a head, because all horses have heads—that is a reference to the nature of Classes; and such a Correlation cannot be represented as merely Triterminal.

5. *Rule of Quadriterminal Correlation.*

Two Terms that are severally the same as, or like, certain other Terms which are related pairwise to one another, are themselves in the same way related.

Or the Rule may be stated thus:—

If there be two Terms related to one another, and a third Term the same as (or like) one of them, there shall be a fourth Term the same as (or like) the other; and these third and fourth Terms shall be related to one another as the former two Terms are related.

Or thus:—

If a Term C be the same as (or like) a Term A that is related to another Term B, there shall be a fourth Term D the same as (or like) B, and related to C as B is to A.

This principle is perhaps less self-evident than the former; and even its special aspects in the laws of the Correlation of the various fundamental kinds of Relations are not all sufficiently certain to be called Axioms.

1. Likeness and Sameness.

Qualitative Relations of Likeness need not be compared in this way. For suppose we wish to find a Correlation which implicates the Relation $C = D$, such a Correlation is indeed given in the expression

$$\overbrace{A = B} = \overbrace{C = D},$$

where $A = C$ and $B = D$. But the Relation $C = D$ is more clearly implicated in two Triterminal Correlations thus:

$$C = A = B \therefore C = B$$
$$C = B = D \therefore C = D.$$

The Logical application of the Rule of Quadriterminal Correlation is to Relations of Succession and Coexistence.

2. Coexistence. (Let $A = C$ and $B = D$).

$$A\ \omega\ B = C\ \omega\ D$$
$$A\ o\ B = C\ o\ D.$$

3. Succession (Let $A = C$ and $B = D$).

$$A\ v\ B = C\ v\ D$$
$$A\ \epsilon\ B = C\ \epsilon\ D.$$

To take concrete illustrations:

$$\left.\begin{array}{r}\text{Men as a Class}\\ \\ \varepsilon\\ \\ \text{Risibility}\end{array}\right\}\begin{array}{c}=\\ \\ =\\ \\ =\end{array}\left\{\begin{array}{l}\text{Any member (unspe-}\\ \quad\text{cified) of the Class}\\ \varepsilon\\ \\ \text{Risibility.}\end{array}\right.$$

Or again:

$$\left.\begin{array}{r}\text{Heating metals}\\ \text{as a Class}\\ \epsilon\\ \\ \text{Expansion}\end{array}\right\}\begin{array}{c}=\\ \\ =\\ \\ =\end{array}\left\{\begin{array}{l}\text{Any metal heating}\\ \\ \epsilon\\ \\ \text{Expansion.}\end{array}\right.$$

The phraseology of the Rule of Quadriterminal Correlation provides that the alternate Terms shall be the *same* or *alike;* and the validity of the Rule is, in the first place, proportionate to the definiteness and amount of the Likeness of the alternate Terms. In the above instances the amount of Likeness is great; where it is considerably less, we have what may be named Analogical Correlations;* of which the following is an example:

$$\left.\begin{array}{r}\text{In an Animal Organism}\\ \text{increase of size}\\ \\ \varepsilon\epsilon\\ \\ \text{Increase of structure}\end{array}\right\}\begin{array}{c}a\\ \\ \\ =\\ \\ a\end{array}\left\{\begin{array}{l}\text{In a Social Organism}\\ \quad\text{increase of size}\\ \\ \varepsilon\epsilon\\ \\ \text{Increase of structure.}\end{array}\right.$$

* Spencer: Principles of Psychology, Part VI. ch. viii.

But even where the Likeness of the alternate Terms is great, there still remains an undesirable lack of certainty about the Rule of Quadriterminal Correlation: and this fault Logic endeavours to rectify by investigating a separate Rule for each of its branches —one concerning Coexistence and the other Succession. It is hoped that by framing principles of less ambitious sweep we may find them more definite and trustworthy. The special Rule of Quadriterminal Correlations of Succession is the Law of Causation; the special Rule of Quadriterminal Correlations of Coexistence is the Doctrine of Natural Kinds.

These principles will be defined in Chapter VI.; and from the Law of Causation will be deduced the Experimental Methods. The theory of Classes, subsidiary to such investigations, will be discussed in Chapter V. And in Chapters VII. and IX. the Relations of Classes will be treated in a way corresponding to some extent with the Scholastic Logic.

Important.

6. *Proof, or Probation.*

Logic has been called with some propriety the Science of Proof; and this seems the best place to consider the nature of Proof and Disproof, or Probation, and how Logic is concerned with it.

That which has to be proved or disproved, is always the Reality or Constancy of some Relation. A question as to the Reality of a Relation is a ques-

tion of a particular Fact; a question as to the Constancy of a Relation is a question of a general Law.

Facts and laws are classed with reference to Proof as Self-evident and Not-self-evident: that is to say, by simply inspecting some facts and laws we feel a very high degree of assurance that they are real or constant; whilst in other cases the Relation is not open to inspection, or only imperfectly so, or for some reason we do not feel sure of its reality or constancy. A Self-evident Law is called an Axiom.

Facts and laws which are not self-evident are proved either directly or indirectly. They are proved directly when they are shown to be implicated in another Relation whose constancy is self-evident, proven, or admitted. The reality or constancy of a Relation is proved indirectly when it is shown, that its Alterutern is either, 1. incompatible with some fact or law, self-evident, proven, or admitted; or 2. implicates another Relation which is thus incompatible.

Now it is only with regard to facts and laws not self-evident that Logic is a Science of Proof; and even then only if the facts and laws concerned are considered as Qualitative rather than as Quantitative. With regard to facts and laws not self-evident and considered as Quantitative, Mathematics, I conceive, is the Science of Proof. In strictness, however, neither Logic nor Mathematics is of purpose a Science of Proof, but only by the way. Their business is to

classify and compare Relations, to state the Axioms of Mediate Relation, and make general deductions from these data; but in doing this, they necessarily at the same time prepare an apparatus of Proof, capable of application in particular or less general cases. Thus to be Sciences of Proof is a proprium of Logic and Mathematics, and as such ought hardly to be included in their definitions.

In Logic the Special Axioms, the Experimental Methods, the Moods of Syllogism, etc., are an apparatus of Proof: and it is true that much of it was elaborated for that purpose. But it needs not have been so: all these formulæ might have been worked out merely for the sake of developing the Science; and they would still have been equally efficient as a means of Proof. In saying this I do not of course deprecate the cultivation of Applied Logic: the reason why I have attempted very little in that direction myself is, that others can do it better.

Thus about those kinds of laws which are not at present susceptible of exact Proof, which cannot be shown to be either directly or indirectly involved in any axiom, I have not much to say. They ought as far as possible to be treated by the Calculus of Probabilities; otherwise they can only be supported in the same way as the axioms themselves; that is, in my opinion, by the particular instances in which they are manifested, analogy to other laws, and the general assumption of Nature's uniformity.

But here, again, I am trespassing beyond the limits of the Science. As to facts and laws that are self-evident, or are generally so regarded, whether they need no further proof, whether further proof be possible, and, if so, what its nature is: these are questions beyond the province of Logic. The conflict of opinion indicates that they do not admit of a Dogmatic, but only of a Critical solution, and are therefore properly discussed in Metaphysics; where under the name of the *Test of Truth*, they form the first and fundamental problem. N. B.

CHAPTER V.

OF CLASSES.

1. *Of Classes in General.*

A Class consists of Terms related by

1. Likeness among themselves.
2. Unlikeness to others.

Horses form a Class, because they are all alike in many respects, and are unlike more or less to all other things. We have already had to speak of Classes: there was the Class of Terms, contrasted with the Class of Relations; and certain subdivisions of these, contrasted with one another.

2. *Of the Constituencies of Classes.*

The Terms of which a Class consists may be called its Members, or Constituents,—severally its Constituents, and collectively its Constituency. The Constituency of a Class, is the extension of the corresponding Concept, and the denotation of its Name. Every horse is a constituent of the Class horse, and all horses together make up the Constituency of that Class.

3. *Of the Determinants of Classes.*

The Determinants of a Class are Qualities, both those in which its Constituents agree among themselves, and those in which they do not agree. By the points of agreement among its members, a Class is Positively determined: by those qualities in which its members do not all agree, it is Privatively determined.

The Positive Determinants of a Class, in so far as they are not possessed by the Members of another Class, or Classes, are called Differential.

The Privative Determinants of a Class are of two kinds: 1. Those which are possessed in common by groups of Terms which also possess the Differential Determinants of the Class, and are therefore included in it (Species); and these Determinants may be called Subordinately Privative: 2. Those which are possessed by Terms which do not possess the Differential Determinants of the Class, and therefore are not included in it; and these Determinants may be called Differentially Privative.

Every Quality is a point of agreement among the members of some Class or Classes: generality of diffusion lies in the nature of a Quality. Hence the Privative Determinants of one Class must be Differential and Positive Determinants of some other Class, or Classes. And the Differential Determinants of any Class must be Privative Determinants of some

other Class or Classes. And since every Class is a Class of Terms or of Relations, and these have not essentially anything in common (for Terminality is only an inseparable accident* of Relations), it follows that all the Positive Determinants of any Class are Differential as to some other Class. And, lastly, as Appurtenance and Defection were with reference to any Term Alterutern forms of every Quality; so with reference to any Class are Positive and Privative Determination.

4. *Of Attribution and Privation.*

The Qualities in which the Constituents of a Class are alike, or by which it is positively determined, may be called the Class-Attributes,—severally the Attributes, and collectively the Attribution of the Class. I would distinguish the words Attribute and Quality thus: Attribute of the Class, Quality of the Term. The Attribution of a Class, then, is the Comprehension of the corresponding Concept, and the Connotation of its Name. Of the Attributes of any Class those which another Class has not are called in relation to the second Class the Differential Attributes of the first. And Qualities which the members of a given Class have not in common, but which confer Attributes on some other Class, or

* See ch. vii. § 11.

Classes, will be either the Subordinate or Differential Privations of the given Class.

Thus the Class White-paper is positively determined by the qualities which confer the Attributes of paper, and whiteness; and (neglecting other complications) among papers the given Class is determined differentially by the Attribute whiteness, and privatively by the differential Privations, red, blue, green, &c., and by the subordinate Privations, cream-white, greyish-white, &c.

5. *Table of Determinants, Attributes, and Privations.*

<table>
<tr><td rowspan="3">Determinant Qualities.</td><td>Positive . .</td><td>Differential . .</td><td>Class-attributes, Positive and Differential.</td></tr>
<tr><td rowspan="2">Privative . .</td><td>Differential . .</td><td rowspan="2">Class-privations.</td></tr>
<tr><td>Subordinate . .</td></tr>
</table>

6. *Positive and Counter Classes.*

Any Class given as positively determined may be called the Positive Class; and then all Terms with regard to which it is differentially determined, all Terms, that is, which lack one or more of its positive determinants, constitute the Counter Class.

A Counter Class has a Constituency, but may have no Attribution: the differential privations of the Positive Class are distributed amongst the members

of the Counter Class; but none of these qualities needs be common to all the members. If however the Counter Class have no Attribution, it must be divisible into Classes that have Attributions; for the differential privations of the Positive Class are positive, and must confer Attributes on Classes. Thus we may speak of the Counter Class or Classes of any Positive Class. And the Classes which have Attributions within a Counter Class, may be called Components of the Counter Class.

Since now the Component of a Counter Class must possess in its Attribution the differential privations of the Positive Class, or some of them, this Attribution of the Component is differential in relation to the Positive Class; that is, every Positive Class is a Component of the Counter Class of every Component of its own Counter Class.

7. *Class and Subordinate.*

As the Terms which possess the differential privations of any Class, constitute the Counter Class, so those Terms which possess the subordinate privations of any Class constitute its Subordinate Class or Classes. In relation to its Subordinates, a Class may be called Superordinate; and Classes so related are otherwise called Species and Genus; of which we shall treat more at length in Chapter VII.

8. *Complementary Classes.*

Since every Quality becomes either an Attribute or Privation of any given Class, and Privations are shared among the Subordinate and Counter Classes; it follows that any Positive Class, with its Subordinate and Counter Classes are Complementary as to the sum of possible Attributes.

And as to the sum of possible Terms, any Class and Counter Class are Complementary; for every Term must be a Constituent of one or the other.

Moreover with reference to any one Term, Class and Counter Class are Alterutern forms or receptacles; for the given Term must be a Constituent of one or the other, and cannot be a Constituent of both; or else the same Quality (positive differential of the Class) must be to the given Term at once an Appurtenance and a Defect.

9. *Subdivision of Positive Classes.*

Since the Counter Class is resolvable into Positive Classes, it is sufficient to treat directly of Positive Classes only.

Positive Classes are formed of Terms by the Likeness of the Qualities of the Terms. And as Terms are, as to their Qualities, either Simple or Compound in various ways; so are Classes with regard to their Attributes. And, again, as Compound Terms have

their Qualities related in various ways, so the Classes which such Terms constitute, have their Attributes related in various ways.

Accordingly Classes are, in the first place, either of Singular or Plural Attribution, have either only one Attribute or more than one. Strictly speaking, the only Classes of Singular Attribution are Terms and Relations themselves considered as Classes. For even Relations of Likeness, besides the quality common to Relations in general, have the special quality of Relations of Likeness; and Simple Feelings, besides being Terms, are differentiated from Terminal Relations. Thus, in strictness, no Classes can be said to be of Singular Attribution, except Terms and Relations,—which are the Logical Summa Genera. But such a restriction of the expression makes it almost useless. We shall do well therefore to extend it to those Classes which, whilst having in reality more than one Attribute, have only one explicit, such as all Classes ostensibly based upon simple qualities—white, resonant, etc. Thus Classes of Singular Attribution may be subdivided into Real and Nominal.

All other Classes are of Plural Attribution; their members possess more than one quality in common. Body, animal, man, are a series of Classes, increasing in plurality of Attribution, whose members are alike in more and more qualities.

In the second place, Classes may be subdivided

according to the Relations involved in their Attributions. And the Attribution of a Class may involve one, or two, or three sorts of Relations,—may be of Single, or Double, or Triple Relationality.

The Classes of Singular Attribution are also the only Classes of Single Relationality; that is, their Attributions involve only one sort of Relation, the Relation of Likeness among their Constituents in virtue of that common Quality, which confers their Attribution.

Classes of Plural Attribution are either of Double or Triple Relationality. For all Attribution involves Likeness; and if a Class possess more than one Attribute, its Attributes must again be related either by Succession or by Coexistence, or in both ways. There are supposable four different combinations of the three Relations.

1. Likeness and Succession.
2. Likeness and Coexistence.
3. Succession and Coexistence.
4. Likeness, Succession, and Coexistence.

The third case we may see to be impossible *à priori*, since it does not involve Likeness, and Likeness is involved in all Attribution.

And the first case is also impossible; for a Class is constituted by Terms, and we saw in Chapter III. that there are no Compound Terms which subsist by Coherent Succession alone.

But the second case is both possible and real: a

Class of Substances is constituted by Terms which are alike in coexistent qualities. The colour, specific-gravity, and other qualities whose Coexistence makes up a piece of gold, are like those whose Coexistence makes up another piece of gold. Here then is a Class of Double Relationality.

And the fourth case is likewise real. A Class may be constituted by members whose like or common qualities are interrelated in each member, by both Succession and Coexistence. Such are all Classes of Causal Instances and Individuals. Thus there are Classes of Triple Relationality.

We find, then, one Class of Double Relationality and two of Triple Relationality; and these latter we may name respectively, Causal and Evolutional. It is indeed common to speak of Classes as if they were always formed of Terms alike merely in coexistent qualities; and Sciences such as Botany, are said to treat of Coexistences, and are called by pre-eminence, the Classificatory Sciences. Still such phrases as "a Class of Causes" are not unheard of; and since Causes carry constant Effects, there cannot be Classes of Causes without Classes of Causal Instances, where the Terms classified are the unities of Cause and Effect. Indeed, that every case of Causation stands for a Class is what makes the phenomenon interesting. What instigates the search for Causes, but the belief that similars will recur? If they do not recur, how can they be investigated? But to admit that

Causal Instances have similars, is to admit that they constitute Classes. Gravitation is a name for the points of resemblance in a vast class of Causal Instances.

The classification of Individuals is dealt with chiefly in Zoology and Botany; which, therefore, are not Sciences merely of Coexistence. And I may remark that since two kinds of Classes arise from Terms whose coherence depends partly on Efficient Relations, such Relations are no less truly Specific, than those Relations of Coexistence to which I have somewhat inconsistently confined the name.

10. *Natural and Artificial Classes.*

Natural Classes are 1. Natural Kinds (with the analogous Classes of Causal Instances), which are formed by the agreement of Terms in the "most numerous and important"* qualities. A quality may be important because of its constancy and wide prevalence, or because it is one on which others are dependent. A Quality on which others depend may be called Fundamental. 2. The Superordinates of Natural Kinds. It appears to be a leading assumption of Science, that a system of Classes exists in Nature, which it is a great part of the business of Science to discover and define, for the sake of the clearest and most comprehensive knowledge. Na-

* Bain: Logic, Book IV. ch. iii. § 2, &c.

ture's classification may not be ideally perfect: we have, however, to borrow of herself the idea with which to disparage it. 3. All Classes explicitly based on single simple Attributes: as white, virtuous.

Natural Classes have to be discovered, but Artificial Classes are made, and are of two kinds: 1. Those which are intended to be Natural Classes, but about which some mistake has been made, so that they depart from the true Classes, and are based on comparatively few and unimportant qualities; most first attempts at classification are of this kind: 2. Classes which are not intended to be Natural, are not invented for the sake of knowledge, but to serve some other purpose; because it is convenient to call by one name things which have so much resemblance as to be often dealt with together, or in similar ways. Common language abounds with words denoting things brought together by obvious, but slight and superficial resemblances. To accept as Natural the classifications thus indicated, is a besetting and pernicious fallacy. We must not expect to find a true classification given by languages, which have grown in the mouths of men who had only a provincial or appetitive interest in the world.

Artificial Classes, as for instance *Town Councillor at X.*, sometimes have the peculiarity that the number of Members is expressly limited, so that to be (say) one of twenty becomes a Class-attribute. It is only in Artificial Classes that to be one of a certain

number can be a Class-attribute: in a Natural Class the number of Members, even if supposed to be known, could not properly be said to be determinate, since the possibilities of Nature with regard to the production of instances is unknown, and it is generally better to think of it as inexhaustible.

11. *Table of Classes.*

- Counter.
- Positive
  - Artificial.
  - Natural
    - Plural Attribution
      - Triple Relationality
        - Evolutional.
        - Causal.
      - Double Relationality.
    - Single Relationality and Singular Attribution
      - Nominal.
      - Real—Logical Summa Genera.

CHAPTER VI.

OF THE DISCOVERY OF CLASSES, ETC.

1. *The Problems of Logic.*

THE Problems of Logic, as distinguished from its Theorems, are those involved in the discovery and arrangement of Classes.

To classify, in the widest sense of the word, is the one task of intelligence. The whole task is not left to be performed by scientific inquirers: part of the work is done by the structure of our organisms; the special senses, for instance, are a machinery for classifying sensations: part of the work has been done by unscientific observers, and is preserved by tradition and the use of language. The classification done by the organism has its truth guaranteed by the widest and longest experience, and is irreversible. Traditional classifications, though often useful, have been tried by much less severe tests, and are liable to revision. On the whole, however, the classifications given by the organism and by tradition are of the simpler matter; the Classes so formed are marked with few attributes or with only one. The work left to be done, besides revision, is chiefly the discovery

of more complex Classes, formed by the Likeness of Terms in many qualities, coexistent, or successive, or both.

Classification, whether organic or deliberate, involves essentially similar processes of observation and comparison, but when deliberate seeks to be methodical. The main problem then which we have to deal with is,—to find in what respect Terms represent Classes, particularly Natural Classes: and there is the ancillary problem,—to find rules for effecting the main problem.

In order that a Term may represent a Class, its type must have some stability in Nature; that is, the qualities (if more than one) in respect of which it is classed with other Terms, must be constant in Succession or in Coexistence, or in both ways. We have, then, in the main problem a double problem: 1. To find the points of Likeness among Terms with respect to which they fall into Classes (Definition); and 2. To test the Coherence of these qualities (Probation). And the second has again two cases: i. To test Coherence of Succession; ii. To test Coherence of Coexistence.

There are thus three problems which we desire to work according to methods; and it is part of the province of Logic to discover, if possible, at least the most general methods in each case.

2. *Definition.*

For the first problem, however,—To find the points of Likeness among Terms in respect of which they fall into Classes—for working this problem in its whole breadth, no rules can be given. General advice what to look for can only be, to look for the most fundamental and numerous resemblances throughout Nature. The inward eye for such resemblances—inward, for the task falls largely on imagination—is a natural endowment; and if there are any rules for improving the endowment, they are rules for mental training, whose discovery belongs not to Logic, but to the Science of Education.

The first problem can only be subjected to method by particularizing the inquiry: To find the points of Likeness among Terms in respect of which they fall into a *given* Class. This supposes that the Class in question has already been vaguely indicated, either by common language, or by previous scientific but imperfect classification, or by hypothesis. And thus particularized the problem is that of Definition. To define a Class is to discover and enumerate its Attributes, that is, the qualities common to its Constituents. Rules for conducting this process have been formulated by Prof. Bain,* whose language may be readily adapted to the point of view of the present Essay. The first rule is called the

* Logic: Book IV. ch. i.

There seem. This art is essay much confusion ^ Terms & things -

Positive Method.

1. Assemble for comparison the Terms supposed to come within the Class to be defined.

Having assembled the Terms, we must look for their points of agreement; and this part of the process, though it may be aided by special advice, cannot be reduced to general rules, but demands an eye for resemblances, and patience.

Since now a Class consists of Terms in so far as they are related not only by Likeness among themselves, but by Unlikeness to others, this first canon is supplemented by a second, called the Negative or

Counter Method.

2. Assemble for comparison the Constituents of the Counter Class, or Classes, especially of those most liable to be confounded with the Positive Class.

Thus if the Class to be defined be the Sparrow, we have first to examine sparrows and state their common characteristics, and then to complete the process by dealing in a similar way with the Counter Class. The Counter Class to Sparrow is, in the first place all other Terms; but since this is inconveniently and uselessly large, we have secondly other birds, and especially finches, &c.

By thus working the double method, we can hardly fail whilst defining Class and Counter Class, to

discover also the Attributions of Superordinate Classes comprising both.

Such are the rules for taking the first step in the discovery of a given Class: the process is plainly one of generalization. The only case in which the process of defining is not by direct generalization, is what Prof. Bain calls Deductive Definition; which was formerly regarded as the only Logical mode of Definition. Once more to adapt his statement:

3. When Classes of Plural Attributions are formed by compounding the Attributions of simpler Classes, as in the Deductive Sciences, they may be defined by stating their composition.

Thus the Class Rightangled Triangle, having the Attribution of the Triangle with the particular addition of being Rightangled, it is unnecessary to generalize it afresh: advantage is taken of previous generalization.

3. *Probation.*

Suppose, then, that a Class has been provisionally defined, and proposed for recognition; by what rules may we judge of the coherence of qualities in the Terms alleged to constitute it; particularly of those qualities on which it is proposed to base the Class; whether the representative Terms be

1. Causal Instances;
2. Substances;
3. Individuals.

Since we cannot by simple inspection perceive the constancy of Relations among concrete things, we want to investigate general marks or signs of constancy. It was by not indicating sufficiently definite and trustworthy marks of constancy, that the Rule of Quadriterminal Correlation seemed unsatisfactory. And we have now to amend that fault, by specializing and filling out the Rule in its two great branches,—the Law of Causation, and the Doctrine of Kinds. These principles are already recognized: we have not to discover, but only to clarify them.

4. *Causation in General.*

Of all that concerns Philosophy nothing is more important than the nature of Causation. Nothing has been more debated; and therefore it is difficult to treat the subject in this Essay, which avoids debate, without an appearance of presumptuous brevity; but with this apology I must venture.

In the first place then it is assumed for the present that Causation involves a Relation of Succession among phenomena, that Cause and Effect may be regarded as Antecedent and Consequent. The phenomena related may be regarded as lying—

1. Wholly in the Object, as in the events of outward Nature.
2. Wholly in the Subject, as in a series of ideas or feelings.

3. Concurrently in Object and Subject, as when a series of ideas is viewed in concomitance with a series of neural changes.
4. Partly in the Object partly in the Subject, as if an objective Cause should have a subjective Effect in Sensation, or a subjective Cause an objective Effect in Volition.

On examining these cases we shall find two distinct kinds of Causation :

1. Involving a transfer of Energy.
2. Involving no transfer of Energy.

In all the events of outward Nature there is some transfer or transformation of energy, and so of course in those nervous processes, which the Physiologist regards as the Causes or Occasions of mental processes. But there is no transfer of energy from Object to Subject (Consciousness) in sensation, nor from Subject to Object in volition, nor from state to state of the Subject in a train of feelings or ideas. For although these ideas, sensations, and volitions are considered to be the signs of a transfer of energy, namely, in corresponding changes of the nervous system, or between the nervous system and the environment, yet the psychical states themselves neither receive, conduct, nor impart it.

Concerning these Relations of Coherent Succession which involve no transfer of energy little needs here be said. With respect to purely mental states, the Law of Causation appears as the Law of Association

of Ideas; and as to the relation of Object and Subject, certain special laws have been investigated in Psychophysics. Perhaps if we consider how closely the notion of Cause is usually connected with the notion of Energy, it may be made a question, whether the word Causation should not be restricted to Relations of objective phenomena, and the word Occasionality be applied to corresponding Relations of mental and psychophysical phenomena. Laws of Relations of Constant Succession might then be divided into Laws of Causation and Laws of Occasionality. This I leave to be considered; merely remarking that to borrow a phrase of the Occasionalists, needs not occasion our taking their hypothesis too.

Rather q.d. sugge

Hume, rejecting this distinction, could show that there was no one quality common to all Causes and Effects:* but Motion is such a quality, if we confine Causation to phenomena of the Objective Order.

5. *Objective Causation.*

We come, then, to consider the nature of Causation as exhibited in objective phenomena. And, first, we remember that Causation always occurs in concrete cases; for which reason we could find no example of a Class whose members should consist each of two

* Treatise of Human Nature, Book I. part 3, § 2.

"Simple Terms related as Cause and Effect;" such a case being only an abstract supposition.

Any case to be investigated requires particular limitation and description, and to this end comparison if possible with similar cases: this is the provisional Definition of a Causal Instance. For the chain of Causation is as long as Time; the Causes of any event appear to be of infinite regress: and it has to be determined what link or links of the chain shall be taken account of in a given investigation. The motion of the planet at the present hour may be ascribed to its motion in the proximate past, together with the neighbourhood of the sun; or we may go back to some supposed origin of the planet and its motions. The price of corn may be viewed as dependent on the "higgling of the market," the state of the weather, the harvests in America, the spots on the sun, etc.

This limitation of the investigation is conditioned by the point of view, and the nature of the event. The point of view may be popular or scientific: "What was the Cause of death?" is not the same question to a Coroner and to a Physiologist. In the popular view the limitation will be determined—Prof. Bain suggests*—by the interesting points of the case. To inquire the Cause is generally as much as to say, "By what means may one in such circum-

* Logic: Book III. ch. iv. § 4.

stances secure a similar good or avoid a similar evil?" But in a scientific investigation the aim seems to be to make the limitation as narrow as possible, in order that the investigation may be exact and exhaustive. So that between Cause and Effect as popularly regarded, the scientific eye may distinguish many steps of Causation. A Coroner finds that a man died of poison: a Physiologist traces the influence of a particular poison from the stomach to the blood, and from the blood to the nervous system. The scientific view, thus compared with the popular, appears as a deeper explanation in Mill's second mode.

But the limitation of the investigation depends again upon the nature of the event; and generally, the less complicated the phenomena, or the fewer the forces and circumstances concerned, the more an investigation admits of being narrowed; whilst the more complicated the phenomena, the wider the investigation, and the larger the gaps of time and undefined procedure of Nature, which have to be tolerated. Hence in concrete Sciences, such as Geology and Sociology, causes are assigned in a more popular manner than in the abstract-concrete Sciences, where the phenomena are less involved.

Further, the case to be considered requires particular description. Within the limits assumed for a given Causal Instance, it is necessary to take account of all the concurrent agents and circumstances

whether positive or counteracting. Here again the popular view of Causation differs from the scientific. To quote Prof. Bain,* "In common language, the Cause of an event is some one circumstance selected from the assemblage of conditions, as being practically the turning point at the moment." A man slips his foot on a ladder, falls, and is killed. The Cause of death is said to be the slipping, without taking account of the height of the fall, the nature of the ground, etc. On the other hand, "in scientific investigations the Cause must be regarded as the entire aggregate of conditions or circumstances requisite to the effect."

And it is desirable that the Effect should be recorded no less fully and particularly than the Cause. That the ground on which the man fell (to return to the above illustration) was slightly raised in temperature by the concussion, could not but seem an impertinent piece of evidence at the inquest; but in a scientific investigation circumstances apparently as insignificant might prove to be of great importance. Such was the heat arising from the condensation of air in the transmission of sound; by taking account of which La Place supplemented the shortcomings of previous calculations with respect to the velocity of sound. It is of course not desirable that this particularity of description should go the length of pedantry, by the enumeration of

* Logic: Book III. ch. iv. § 5, 6.

conditions obvious and generally understood, or known to be indifferent. "There is a legitimate ellipsis of expression even in the scientific enumeration of conditions."

6. *Analysis of Causation.*

A Causal Instance thus limited and described, involves certain changes which are regarded as dividing it into Cause and Effect. The Cause has been analysed by Professor Bain * by help of the Law of the Conservation of Energy, and divided into 1, a Collocation, and 2, a Moving Power. The Collocation in any case is some set of circumstances regarded as passive, or producing no Effect if let alone, or, if any, some Effect different from that whose Cause we are looking for. The Moving Power is that event which disturbs the comparative passivity of the Collocation. If we ask the Cause of an explosion, we may be told that there was a barrel of gunpowder, and near by a workman smoking his pipe: this was the Collocation which might perhaps have lasted for ever without any explosion. But a spark from the man's pipe fell into the barrel: this was the Moving Power. Both a Collocation and a Moving Power are always necessary to the production of an Effect; or it may be more correct to say, that any Cause admits of

* Logic: Book III. ch. iv. § 8.

being viewed in this twofold aspect: where there are several Moving Powers equally conspicuous, anyone being taken, the rest may be regarded as the Collocation; but sometimes the Moving Power, sometimes the Collocation may, in a sense to be presently explained, contribute most to the Effect.

The whole Cause thus divided into Moving or Inciting Power, and Collocation, may be viewed again in other two aspects; namely, 1, as to the amount of Energy embodied; and, 2, as to the Concomitant Phenomena. The Concomitant Phenomena comprise, (1) the action of the Cause on our senses, and (2) the distribution of Matter with respect merely to position.

And similarly in the Effect we may distinguish Energy embodied and Concomitant Phenomena: the Concomitant Phenomena being here (1) the action of the Effect on our senses, and (2) the redistribution of Matter with respect merely to position. It is true that by including amongst the qualities of a Causal Instance its action on our senses we are complicating it with a subjective Collocation, and thus mixing up Causation proper with Occasionality. But as it is impossible to prevent the consequences of the subjective Collocation intruding themselves into the picture of the objective process, which however they in no wise modify; it seemed better to introduce them thus explicitly with a label attached.

7. *Law of Conservation.*

The amount of Energy embodied in any Effect is, according to the Law of Conservation, equal to that embodied in the Cause. Objective Causation, it was remarked above, is characterised by a transfer of energy. The same energy, it may be said, which is embodied in a Cause becomes reembodied in its Effect; though it may, or may not, be partly, or wholly transformed in the process. Thus:

1. Molar motion may be transferred as such, as when a cannon ball knocks down a wall.
2. Molar motion may be transformed into Molecular as when heat is produced by the friction of a wheel.
3. Molecular motion may be transferred as such, as in the heating of one body by the neighbourhood of another of higher temperature.
4. Molecular motion may be transformed into Molar, as in working a machine by steam.
5. Actual motion, whether molar or molecular, may be transformed into Potential, as when a stone is thrown to the top of a cliff.
6. Potential motion may be transformed into Actual, as in an explosion of gunpowder.

A Causal Instance may comprise more than one of these changes, but some or one of them must be always present, and may be said to form the Essence of every Causal Instance. And in every Instance

the amount of energy embodied under all forms in the Effect is equal to the amount embodied under all forms in the Cause. Thus, if a mass in motion strike another at rest, though it may often seem as if the second mass gains less than the first loses, the whole of the motion lost by the first is really accounted for, if to the actual molar motion transferred we add any energy of position which may be acquired by either mass, together with the mechanical vibrations, heat, &c., generated by the concussion.

And it is perhaps worth noticing that the energy embodied in the Effect may be analysed, mentally at least, into that which has been contributed by the Moving Power and that which has been contributed by the Collocation. Whether a cannon ball be only pushed off the edge of a cliff, or be shot from the same elevation horizontally across the sea, the work done when it touches the water is in each case equal to the joint energies of projection and gravitation, that is, to the joint energies of the Moving Power and Collocation (height of cliff and mass of ball). Of the Effect of a chemical combination a similar analysis holds good. For example, in the explosion of gunpowder at the touch of a spark, there is, 1, a rise of temperature equal to the heat lost by the spark; and, 2, a further rise of temperature, evolution of light, sound, and mechanical motion equal to the energy latent in the gunpowder. Again, where a mixture explodes on being stirred, the Effect comprises, first,

the motion due to the act of stirring (not all of which is realized in the mixture); and, 2, the energy evolved and reabsorbed by the combination of the substances mixed.

It is in this sense that sometimes the Moving Power and sometimes the Collocation contributes most to the Effect; both are equally necessary to the occurrence of the Effect, but do not contribute equally to its magnitude. And thus it sometimes happens that the most obvious and striking circumstance of the Cause, corresponds to the least noticeable part of the Effect; and that some unobtrusive factor of the Cause, contributes most to the Effect: whence the apparent disproportion between Cause and Effect, which has sometimes been insisted on. A court intrigue seems, certainly, an inadequate Cause of war; but mental infirmities make it to many people a more interesting circumstance than the long smouldering of international jealousies.

8. *Persistance of Relations among Modes of Energy.**

Not only is the amount of Energy embodied in the Effect equal to that embodied in the Cause: on every recurrence of the same Cause its Energy is reembodied in the Effect under the same forms, and distributed among those forms in the same proportions; and any

* Spencer: First Principles, Part II. ch. vii.

difference in these respects between two Effects is due to corresponding differences between the Causes. A heap of gunpowder is apparently quite inactive, though embodying vast potential energy: at the touch of fire its energy is unfolded and takes various forms,—light, heat, sound, chemical combination, and expansion. The same amount of gunpowder of the same quality, similarly ignited, will always unfold the same amount of energy, which in the same circumstances will take the same forms in the same proportions. These phenomena considered as modes of motion, have concomitant phenomena in modes of sensibility and the redistribution of matter. The redistribution of matter is implicated in the actualization of energy; and manifestation in modes of sensibility depends on a special Collocation, namely, the presence of the Subject. Hence the fact that the same Cause always gives in its Effect the same amount and distribution of energy, implicates the further fact that the recurrence of the same Cause always gives in its Effect the same sensible phenomena and redistribution of matter. Thus to return to our gunpowder, it was at first non-luminous, about the temperature of the environment, silent, tangible, and occupied a certain space. On its ignition all these qualities are changed; it assails the senses with light, heat, noise, and odour; is no longer tangible, except to imagination; occupies as a whole much more space, and as to its parts different positions.

If the dynamic change or changes involved in any Causal Instance be called its Essence, the Concomitant Phenomena may be called its Propria.*

9. *Quantitative and Qualitative Aspects of Causation.*

The equivalence of Cause and Effect with respect to energy embodied, the persistence of relations amongst modes of motion, and the distribution and redistribution of matter, are facts of quantity and measurement, requiring Mathematical rather than Logical treatment. The reasons for discussing such subjects here are, first, that in default of a competent First Philosophy, its problems get parcelled out among what are called the Moral Sciences, among which Logic curiously figures; and, secondly, that although the facts of objective Causation are essentially quantitative, and that equally in all Sciences, in the more complex Sciences it is hardly yet possible to treat them as such, but only by means of the qualitative manifestations which are marks of them. Qualitative Relations require Logical treatment, and are naturally discussed here; but since qualitative Relations are often regarded as derivative, they are only intelligible in connection with the quantitative Relations which they correspond with and adumbrate, and which, therefore, must first be considered.

* Cf. ch. vii, § 11.

It often happens that a quantitative and a qualitative Relation are constantly concomitant, so that either may serve as a mark of the other. To take the quantitative Relation as the mark is to treat the matter Mathematically; to take the qualitative, is to treat it Logically. As the more fundamental and definite, the quantitative Relation is to be preferred whenever it can be obtained. There was a time when Physics and Astronomy were in much the same condition as Sociology is now; and the progress of explanation promises in the future, as in the past, to continually supersede Logical by Mathematical methods. But although the quantitative aspect of Causation has ever since the Renascence been rapidly gaining recognition in special Sciences, until recently it has too little occupied Metaphysicians. For Hume, Science is either of quantity, or of "matter of fact and existence" * (including Causation), as if it could not be of both at once.

10. *Are Cause and Effect Identical?*

Much has lately been done to clarify our notions of Causation by Mr. Lewes; with whose opinions I am generally happy to agree; and if any views here expressed seem to diverge from his, the reason is, chiefly, that the relative discussions in "Problems of Life and Mind" are Metaphysical, whilst these

* Inquiry concerning Human Understanding: Part III. § 10.

remarks are subservient to the purposes of Logic. Thus it is maintained in that work that Cause and Effect are identical,* which is not discordant with the view here taken that they form together a coherent whole; and when it is stated that to regard Cause and Effect as Antecedent and Consequent is a Logical artifice, this needs not prevent the writer admitting that such an artifice may be very judiciously employed. Judicious artifices are the scaffolding of Science; and if a Metaphysician on duty points out that the scaffolding is not the structure, it is not to be inferred that he wishes the scaffolding to be pulled down before the structure is completed.

Certainly every Causal Instance takes time, or the World must run through all its courses in no time. A Causal Instance takes time, and this time we may suppose divided; and if the processes occupying the two divisions are noticeably different, they naturally acquire different names; and so we get Cause and Effect as Antecedent and Consequent. Mr. Lewes himself speaks of Cause and Effect as "two aspects of the same phenomenon;" and as these aspects are surely successive, that is enough to justify the ordinary expressions. If people suppose that because the two aspects of a Causal Instance have different names they are essentially different things, that is no doubt an example of the vulgarest error. But the

* Lewes' Problems of Life and Mind: Problem V., ch. ii. (vol. II.)

distinction, however much abused, has probably done more good than harm.

I say a Causal Instance takes time, but how much time depends upon the limitations assigned in any given case. A Causal Instance is in fact itself an artifice: it is a certain length or piece selected by us out of the infinite fabric of Nature. In Nature there is neither break nor seam; but to serve our purposes of study or practice, we suppose a partition and draw a line. It is an affair of convenience; and since it is sometimes convenient to deal with a large portion of Nature, sometimes with a small, some Causal Instances take a long time, others an infinitessimally short time. Science, seeking exactness and exhaustiveness, narrows its Causal Instances as much as possible. But if Causation were confined to isolated motions of absolutely simple matter, the two aspects of the same phenomenon would still remain.

11. *Can a Cause exist before its Effect?* *

It must be admitted that to speak of Cause and Effect as Antecedent and Consequent lays one open to certain criticisms which are as old as Ænesidemus. If a Cause is antecedent to its Effect, it must surely exist before it. But a Cause as such is operative, and to operate is to produce some Effect; so that

* Cf. Hume: Treatise, Book I. p. 3, § 2.

it seems as if the Effect must exist as soon as the Cause. There thus appears to be a conflict between the connotations of Cause and Antecedent; from which we might argue that those in whose minds the connotations grew, did not clearly understand the phenomenon to which they applied both names. The conflict however is not irreconcileable. To be a Cause is indeed to operate, but to operate is to move, and motion takes time: although then between the first operation of the Cause and the first origin of the Effect there may be no appreciable time, some time there must be if there is any operation; and as with the increasing operation of the Cause the Effect also increases, we may say that every moment of the Effect is preceded by some moment of the Cause: so that although the Cause as a whole and the Effect as a whole, do not stand on either side of an even line as Antecedent and Consequent; still the whole Cause is Antecedent, taken in its moments; and the whole Effect is Consequent, taken in its equivalent and corresponding moments.

12. *Does the Effect cease with its Cause?*

If an Effect be a Consequent, it must awhile outlast its Cause; that is, the second aspect of a Causal Instance outlasts or rather supersedes the first. But on the other hand an Effect is only

the Cause transformed. There is no contradiction in saying, 'The Effect outlasts the Cause: the Effect is the Cause': if in the one sentence we speak of form, in the other of matter. An Effect certainly does outlast its Cause, as a second aspect of the Causal Instance, and this in every case; although by the subtle continuity of Nature its survival may be only momentary, before it becomes intermingled with new Causes and new Effects.

When it is said without such qualifications as have been here suggested, that the Cause may exist before the Effect, or the Effect after the Cause, the error may be traced to various sources.

1. The Cause or Effect spoken of is usually not the whole Cause or Effect as above defined. Thus one may argue that as the seed of this year's crop was part of last year's crop, last year's crop was the Cause of this year's, and of Course existed before it. But seed is not the whole Cause of a crop; and no one doubts the pre-existence of the several factors of any Cause. And when it is said that a ploughshare exists long after the Causes have ceased which produced it, we have to notice (i.) that the form of the ploughshare is not the whole Effect of the operations which produced it; and (ii.) that these operations were not the whole Cause, for the Cause included the iron of which the ploughshare was made.

2. Another reason why Effects are often believed

to outlast their Causes is, that in some cases the interesting circumstance of the Effect is much more stable than in others. The interesting circumstance in the Effect of housebuilding is the house, which may last many years; in setting off a firework the interesting circumstance is almost instantaneous.

Or, 3, the Causal Instance selected may be too large for scientific treatment. Some one may say that the Causes of the French Revolution, were bad social and political arrangements and Human Nature, and that these existed in France long enough before the Revolution. If this statement be accepted, it may be reconciled with our view of Causation in two ways: either we may distinguish between Mediate and Immediate Causes, and call the state of France in the 17th century the Mediate Cause (or Part-Cause) of the Revolution (this is to subdivide the Instance): or we may say boldly, that as soon as the Cause began to operate the Effect began to arise; that where there was oppression, there were criticism and discontent, and these were the beginnings of the end. In which of these ways an unwieldy Instance should be treated convenience may decide.

13. *Is the Effect like its Cause?*

A Causal Instance is a natural process of more or less complexity and taking more or less time,

during the earlier part of which one set of phenomena is conspicuous, whilst during the latter part another set of phenomena becomes more conspicuous; whence the distinction of Cause and Effect: the transition may be more or less sudden. I cannot therefore altogether deny that Cause and Effect are unlike one another. They are indeed alike as to matter, or rather identical, and equal as to the amount of energy embodied; but as to the modes in which the energy is manifested, and the concomitant phenomena,—the general opinion that Cause and Effect are contrasted seems in this respect to be well-grounded. It is true that where the Effect is a 'Resultant,' to use Mr. Lewes' valuable distinction,* it is less unlike the Cause than where it is an 'Emergent.' The altered directions of two moving bodies after collision are less unlike their previous motions than a chemical combination is unlike its elements. But the less unlikeness is after all a grave difference: and the altered directions of the bodies are never the whole Effect; more or less insensible motion is generated, and this is still less like the Cause.

On this question I cannot quite follow Mr. Lewes. In denying what Hume and others have assumed, the unlikeness of Cause and Effect, he seems not to take them in their own meaning. When Mr. Lewes says,†

* Problems of Life and Mind: Problem V. ch. iii. (vol. II.)

† Problems of Life and Mind: Problem V. § 66.

"Unlike as water is to oxygen or hydrogen separately or to both when uncombined, nothing could be more like water than their combination which is water;" I can hardly conceive the subtlest sceptic raising any objection, except to the assumption that he had some objection to raise. He would say, I conceive, that in maintaining the unlikeness of Cause and Effect he had meant just, that oxygen and hydrogen when uncombined (together with a flame, or some other Inciting Power) were unlike themselves after combination: and this, I believe, has generally been meant. Mr. Lewes himself admits that "an emergent is unlike its components in so far as these are incommensurable, and it cannot be reduced either to their sum or their difference:" and this would apply to some of the concomitant phenomena. In short each Causal Instance is a miniature, as it is a factor of the whole World; in which the same matter and motion persist from time to time, but are transformed.

14. *Are there Vicarious Causes?*

That the same Cause has always the same Effect is universally acknowledged; but it is still made a question whether the same Effect may not be produced by different Causes. Indeed the general opinion is that it may be; and this fact, or supposed fact, has been erected into a principle under the name of the "Plurality of Causes." The name is

ambiguous: it might mean several Causes to the same Effect at the same time, or at different times; or it might refer to the different factors of an aggregate Antecedent. I would suggest as a more suitable phrase—the *Vicariousness of Causes.*

The Vicariousness of Causes, then, is a principle generally assumed, and at first sight the facts seem to bear out the assumption. There are, says Prof. Bain,* many ways of getting a livelihood, many causes of pleasure and pain, many causes of death, &c.; and admitting that much of this apparent vicariousness is superficial, he still takes account of it as a circumstance frustrating the Method of Agreement. Mr. Lewes, on the other hand, altogether rejects the hypothesis. It seems to me, if I may venture an opinion, that for the present the Vicariousness of Causes must be practically recognized, at least in the more complex Sciences, but that the Peculiarity of Causes (if I may use the expression) is really true, and to be taken as a regulative principle whose verification is to be continually aimed at.

The Methods by which an apparent Vicariousness of Causes may be got rid of, seem to be chiefly two: 1, the Generalization of Causes; 2, the Particularization of Effects.

The generalization of Causes is of course a constant

* Logic: Book III. ch. viii. § 2.

aim of Science. The Causes of motion are found to be always previous motion; this is the one Cause, and here the generalization is complete. But it may be objected that to generalize Causes is to view them in the abstract, and that this disguises the real facts, for that Causation is always of the Concrete. The answer to this objection is to apply the second method.

It is true that Causation is of the Concrete; let us then consider any given case in the minutest detail. We must not, for instance, ask, "What are the Causes of motion?"—but, "What are the Causes of a particular movement, or group of movements, of particular bodies, particularly circumstanced?" The motion of a bullet may be due to various modes of projection; but its course and velocity will not be the same, whether it be cast by the hand or shot out of a gun. And, besides, the mere flight of a bullet is never the whole Effect: if fired from a gun, there is also the recoil; if thrown from the hand, the whole energy of the arm and body is not realized in its flight, but is partly expended in superfluous contortions: and so on. An Effect thus particularized can never, I believe, arise from different Causes. The notion that Vicarious Causation is possible, and the practical necessity of allowing for it, seem to have the same origin as most other difficulties in the theory of Causation; namely, the vagueness, fragmentariness, or unwieldiness of Causal Instances, as usually conceived, or as from the

complexity and subtlety of Nature we are compelled to frame them. But the peculiarity of Causes seems to agree best with the idea of the Causal Instance as a coherent Compound Term.

15. *Law of Causation.*

The Law of Causation may be thus summed up:—

(1) Every event is an Effect consequent upon some other event, its Cause (whether or not its only possible Cause); (2) and the same Effect always recurs on the recurrence of the same Cause; (3) and the quantity of Energy embodied in the Effect is equal to the quantity of Energy embodied in the Cause.

This law, so far as qualitative, declares the certainty of Effects of some sort, and their constancy, but gives no hint of what sort they will be: the quantitative clause is, however, more distinctly prophetic, and predicts the equality of Effects to their Causes.

It will be observed, too, that the second and third clauses amount to affirming, that between Cause and Effect a Relation of Constant Succession constantly coincides with a Relation of Quantitative Equality. These Clauses of the Law then may be symbolized thus:—

Class of Instances of the contact of Fire and Gunpowder	=	Single Instance of such contact
$\Vert$	=	$\Vert$
Explosion	=	Explosion

The Law of Causation is also the Definition of Causal Instances in general: the incidents enumerated in its three Clauses are the Attributes of the Class of Causal Instances, the qualities or marks by which a Relation of events is recognized as a Relation of Constant Succession by Direct Causation.

16. *Elimination of Causal Instances.*

Cause and Effect make together a coherent whole or Causal Instance, which in the immensity of Nature may recur indefinitely often, and therefore represents a Class. But the claims of any Instance to represent a Class rest upon its stability and coherence. For although every Causal Instance involves a Relation of Succession only a few of the innumerable events related by Succession are Causal Instances; since in the majority of cases the Relation is not constant. We have then to distinguish amidst the innumerable multitude of Relations of Succession, the Coherent, and especially the Efficient; and this is done by

comparing cases offered with the above Law or Definition.

When a case offers for investigation, and we note the circumstances, the first description or definition may comprise circumstances not really belonging to the Causal Instance,—superfluous circumstances, which contribute nothing to the Cause, and remain unaltered in the Effect; so that the Effect would equally have occurred if they had not been present: these superfluous circumstances have to be set aside. Again, a Causal Instance, as at first defined may be a group of Instances to be severally investigated: the Cause may be separable into Concurrent Causes, whose peculiar Effects may, or may not, be distinguishable in the Joint-Effect. If many Effects are distinguishable in the Joint-Effect, any part of the Joint-Effect being taken for investigation, the Causes of the remainder may be regarded as superfluous circumstances to be, if possible, set aside. The process is thus in any case one of 'Elimination:'* to find the Cause (or Effect) of a given Effect (or Cause) amongst other circumstances not efficiently related to it: and we may seek the Efficient Relation either directly; or indirectly, by rejecting all that are non-efficient.

* Bain: Logic; Book III. ch. v. § 1.

Part on – Methods worth careful looking u

17. *Deduction of the Experimental Methods.**

The Experimental Methods are deducible from the Law of Causation as above stated.†

a. The first clause of the Law teaches—

That every event is an Effect consequent upon some other event, its Cause; and we assume for the present that it has only one possible Cause; that is to say—

1. Whenever E is present C is present, or not absent; wherefore "whatever antecedent can be left out without prejudice to the Effect can be no part of the Cause."‡ Hence what is called the

Method of Agreement.

If two or more instances of a phenomenon under investigation have only one circumstance in common, that circumstance is the Cause (or Effect) of the phenomenon.

Let $\frac{\text{A C}}{a\,\text{E}}$ and $\frac{\text{C D}}{\text{E}\,d}$ be two instances of the occurrence of E; since both A and D can be left out without prejudice to E, and are therefore not the Cause, it is concluded that C which is always present is the Cause of E.

* Cf. Mill: Logic; Book III. ch. viii. ix. Bain: Logic; Book III. ch. v., vi., vii.

† Cf. Bain: Logic; Book III. ch. v. § 6. Sir J. Herschell: Discourse on the Study of Natural Philosophy; § 145.

‡ Bain: Logic; B. III. ch. v. § 6.

Again: since whenever E is present C is present,

2. Whenever C is absent, E is absent; wherefore "when an antecedent cannot be left out without the consequent disappearing, such antecedent must be the Cause or part of the Cause."* Hence the

Method of Difference. (1)

If an instance where a phenomenon occurs and an instance where it does not occur have every circumstance in common, except one, that one occurring only in the first; the circumstance present in the first and absent in the second, is the Cause, or a part of the Cause of the given phenomenon.

Let $\frac{\text{A B C}}{a\ b\ \text{E}}$ and $\frac{\text{A B}}{a\ b}$ be two instances, having every circumstance in common, except that C and E are present in the first and absent in the second: since where E is present C is present, and on the withdrawal of C, E also disappears, it is concluded that C is the Cause or Part-Cause of E.

β. From the second clause of the Law of Causation we learn—

That the same Effect always recurs on the recurrence of the same Cause; that is to say—

* Bain: Logic; Book III. ch. v. § 6.

1. Whenever C is present E is present; wherefore when an antecedent cannot be introduced without the consequent appearing, such antecedent must be the Cause, or a part of the Cause. Hence a second aspect of the

Method of Difference. (2)

If an instance where a phenomenon does not occur and an instance where it does occur have every circumstance in common, except one, that one occurring only in the second; the circumstance absent in the first and present in the second, is the Cause, or part of the Cause, of the given phenomenon.

For the two cases before and after the introduction of the Antecedent differ only in this circumstance and the appearance of the Effect:—

$\frac{\mathrm{A\,B}}{a\,b}$ and $\frac{\mathrm{A\,B\,C}}{a\,b\,\mathrm{E}}$.

Again: since whenever C is present E is present,

2. Whenever E is absent C is absent; wherefore whatever circumstance introduced does not give rise to a certain Effect is not the Cause, or not the whole Cause. Hence what may be called the

Indirect Method of Difference.

If two instances of the absence of a phenomenon under investigation only differ in the presence of

one circumstance, that circumstance is not the Cause, or not the whole Cause, of the given phenomenon.

Let $\frac{A\,B}{a\,b}$ and $\frac{A\,B\,D}{a\,b}$ be two cases in which E is absent, and only differ by the presence of D in the second case; since on the introduction of D, E does not follow, D is not the Cause of E.

(D may be a necessary condition of E; or may be the whole Cause, but counteracted; hence a knowledge of the precedent circumstances is needed.)

γ. According to the third clause of the Law of Causation—

The quantity of Energy embodied in the Effect is equal to the quantity of Energy embodied in the Cause. That is, with respect to the amount of Energy embodied—

1. E is equal to C, and varies as C; wherefore "an antecedent and a consequent rising and falling together in numerical concomitance are to be held as Cause and Effect."* Hence the

Method of Concomitant Variations.

Whatever phenomenon varies in any manner whenever another phenomenon varies in some particular manner, is either a Cause or an Effect of that phenomenon, or is connected with it through some bond of concomitance.†

* Bain: Logic; B. III. ch. v. § 6.

† Cf. § 18.

Again: since E is equal to C, neither E nor C can be greater or less than the other, and if either appears to be so, some portion of the whole Causal Instance must remain to be explored. Thus since E is equal to C,

2. $E + x$ must be greater than C, and cannot be the Effect of C alone; wherefore Antecedents whose Effects are fully known cannot be the Causes of other simultaneous Effects. Hence the

Method of Residuary Effects.

Subduct from any phenomenon such part as previous induction (or probation) has shown to be the Effect of certain Antecedents, and the residue of the phenomenon is the Effect of the remaining Antecedents.

Let $\frac{A\,B\,C}{a\,b\,E}$ be a phenomenon of which it is known that $\frac{A}{a}$, $\frac{B}{b}$ are independent Causal Instances; C is the Cause of E: for E must have some Cause; and since A and B are merged in a and b, by hypothesis there is no other Cause for E, than C.

C may be unknown, but we know that it must exist; for since $E = C$, $nE = nC \therefore abE = ABX$; and whatever X is it must be C.

If C be discovered we have the case $\frac{A\,B\,C}{a\,b\,E}$ and the supposable case $\frac{A\,B}{a\,b}$, and thus apply the Method of Difference.

Lastly since E is equal to C,

3. $C + x$ must be greater than E, and cannot be the cause of E alone; wherefore Consequents whose Causes are fully known, cannot be the Effects of other simultaneous Causes. Hence the

Method of Residuary Causes.

Subduct from any phenomenon such part as previous probation has shown to be the Cause of certain Consequents, and the Residue of the phenomenon is the Cause of the remaining Consequents.

Here E may be unknown, but we know that it must exist: and when it is discovered we may apply the Method of Difference as in the last case.

18. *Concomitant Variations.*

It will be observed that the general statement of this Method (γ 1) is too wide to be borne out by the Law of Conservation alone. 1. It refers to phenomena of any kind and not merely to quantities of energy: 2, it takes account not only of Efficient, but also of Coeffectional Relations. For of these, too, the Terms vary together; and a "bond of concomitance" which is of a Causal nature, but not Efficient, must be Coeffectional. Such now is the persistence of Relations among modes of energy; which is almost another expression for the sameness of the Effects of the same Causes: and this I take to be the surest

basis of so much of the Canon of Variations as cannot be derived from Conservation. But there is a treacherous vagueness about the statement, similar to what we noticed in the rule of Quadriterminal Correlation; and Prof. Jevons justly remarks that it needs to be interpreted with caution.* It seems to appeal to experiences not definite enough to be embodied in the Law of Causation, but which have generally accompanied the experiences from which that Law has been formulated, and have generated about it, so to speak, a penumbra of expectation.

19. *Supplementary Methods.*†

The above methods of sifting experience are not always sufficient for the purpose. They are liable to "frustration," chiefly in two ways: 1, by the Vicariousness of Causes; 2, by the Intermixture of Effects.

20. *Vicariousness of Causes.*

If Vicarious Causes be possible (and we have seen that they must be practically recognized) the Method of Agreement is apt to fail. If, for instance, from the two cases $\frac{\mathrm{A\ C}}{a\,\mathrm{E}}$, $\frac{\mathrm{C\ D}}{\mathrm{E}\,d}$ we conclude that C is the Cause

* Principles of Science: vol. II. ch. xxii. § 2.

† Cf. Mill: Logic; Book III. ch. x., xi., &c. Bain: Logic; Book III. ch. viii., x., &c.

of E, this is only valid on the assumption that E can have only one Cause; for if it may have more than one, A may be the Cause of E in the one case, and D in the other.

The Method of Difference is not thus affected. If to the case $\frac{A\ B}{a\ b}$ we add an antecedent C, and get E, it is certain that C is a Cause or Part-Cause of E; though it may not be the whole or the only Cause.

Nor does the Vicariousness of Causes prevent the exclusion of a circumstance from among the supposed Causes of a given phenomenon. If to the case $\frac{A\ B}{a\ b}$, D be added, and E do not follow it, it is certain that D is not the whole Cause of E (unless A or B be a counteracting force).

This defect of the Method of Agreement is to some extent remedied by the following means. To enter upon the subject at length, indeed, would require a preliminary account of the Theory of Probabilities. But this is a branch of Mathematics, rather than of Logic, and although often discussed in Logical works * with a practical aim, hardly falls within the scope of this Essay. I will therefore confine myself as much as possible to considerations merely Logical.

Let C and E be the phenomena whose connection we are investigating: and suppose that we cannot

* Venn: Logic of Chance. Jevons: Principles of Science; vol. I. ch. x., &c. Bain: Logic; Book III. ch. ix. Mill: Logic; ch. xvii., xviii.

Note

apply to them any of the Methods of Difference, or Variations, cannot bring them directly under the Axiom of Causation; and are therefore compelled to resort to an enumeration of instances. Positive and negative together, there are four possible kinds of instances of the concomitance of C and E:—

1. Both may occur together.
2. Both may be absent together.
3. C may occur without E.
4. E may occur without C.

1. Suppose that C and E often occur together. According to the Law of Causation Cause and Effect are a constant sequence; but in the infinite variety of Nature constant sequences are after all exceptional; and therefore there is a high degree of probability that a constant sequence is one of Cause and Effect, or of events related by Causation. If then C and E often occur together there is a probability, varying with other circumstances, that there is some Causal Relation between them: which is measured by the improbability that they would have occurred together had there been no Causal Relation between them; an improbability that increases rapidly as the number of instances of positive concomitance increases.

2. Suppose that C and E are both of them absent together: this is also evidence of their Causal connection. For inconstancy of Relation being the commoner case, it is improbable that separable Terms should not occur separately. And this evi-

dence is strengthened according to the frequency of their occurrence together; for the frequency of their occurrence is some evidence of their frequency in Nature, and according to their frequency in Nature is the probability that they would occur separately if there were no Causal Relation between them.

On these two sets of considerations rests the

Joint Method of Agreement and Difference.

If two or more instances where the phenomenon occurs have only one circumstance in common; while two or more instances where it does not occur have nothing in common save the absence of that one circumstance; the circumstance wherein alone the two sets of instances differ, is the Effect, or the Cause, or a necessary part of the Cause of the given phenomenon.

> Variety is sought in the circumstances of the positive instances in the hope of "bringing out all the Causes;" and in the circumstances of the negative instances to multiply opportunities of separate occurrence.

3. C (the supposed Cause) may be present without E. In such a case we know that either C is not the Cause, (by the second clause of the Law of Causation), or that it has been counteracted. We may not know the conditions well enough to be sure that C has not been counteracted, for that would give the

Indirect Method of Difference, which we suppose inapplicable. We must therefore try to find C without E in as various circumstances as possible, in order to get rid of the counteracting forces. It is very improbable that C should be in all circumstances counteracted.

4. E (the Effect) may be present without C; and this must show that either C is not the Cause, or only one of two or more Vicarious Causes. The former supposition is confirmed if on varying the circumstances, C does not appear in conjunction with E oftener than would be accounted for by pure chance.

From these two sets of considerations then we may deduce an

Indirect Joint Method.

If two or more instances where the phenomenon does not occur have only one circumstance in common; while two or more instances where it does occur have nothing in common, save the absence of that one circumstance; the circumstance wherein alone the two sets of instances differ is not the Cause of the given phenomenon.

> This Method may be employed where simple Indirect Difference is inapplicable, to sift out specious but unreal Antecedents from among a selection of possible Causes.

Other means of dealing with Vicarious Causes are:

1. If C and D both pass for Causes of E, by

particularizing E, and examining it in detail, some difference ought from time to time to be detected in it, according to the difference of its Antecedents. For it seems very improbable that different Causes should produce Effects in quantity and quality exactly equal.

2. If C and D be Vicarious Causes, by the third clause of the Law, on the concurrence of C and D, E ought to be augmented,—at least, where E is a Resultant, and C and D not in mutual counteraction.

Before quitting this subject I may remark that the particular evidence (if any be needed) for the highest general truths and Axioms is not tested by a Method of Agreement merely, but rather by a Joint Method. For that evidence is not only the most frequent experience, but experience without contradiction. From the absence of contradictory experience arises the impossibility of conceiving the opposite; and so the employment of the indirect intuitive method may be regarded as a short way of applying the negative side of a Joint Method.

21. *Composition of Causes, and Intermixture of Effects.*

Causes acting side by side sometimes produce Effects that are distinguishable by simple inspection, as when a violin and a piano are played in concert. But sometimes circumstances acting together produce a joint Effect in which their respective operations are

not directly cognizable. Such intermixed Effects are of two kinds:

1. Where the Part-Effects of the several co-operating circumstances or conditions are homogeneous with one another and with their Antecedents. Such composition is called by Mill, mechanical:* the Effect, Mr. Lewes calls a Resultant.†
2. Where the Effect is not homogeneous with the Antecedents; as when in chemical combination the properties of different bodies disappear, and are replaced by those of the compound. Such composition is called by Mr. Mill, heteropathic; Mr. Lewes calls the Effect an Emergent.

I would avoid speaking of these cases as exhibiting a composition of Causes, or an intermixture of Effects: they present only complex Causes and complex Effects; for the Cause is the sum of the necessary Antecedents, and the Effect is the sum of the necessary Consequents: so that the Causes supposed to be combined are really Part-Causes, which may sometimes be conveniently styled Conditions; and the Effects supposed to be intermixed are only Part-Effects. Similarly the counteraction of a possible Cause constitutes a new and more complex Cause, which also has a complex Effect: and, indeed, in every

* Logic: Book III. ch. vi.

† Lewes: Problems of Life and Mind.

case of the cooperation of Part-Causes, which are not homogeneous and in the same direction, there is more or less counteraction.

Regarding such complex Causal Instances as wholes, and supposing them to be cognizable as such, they are determinable by the Experimental Methods. But a further question arises, namely, to discover what parts, elements, or components of the complex Cause, and what of the complex Effect, correspond with one another. In the second of the above cases, this problem has been only very imperfectly solved: it is known that the weight of an Emergent is equal to the combined weights of its Antecedents; but in what other ways they have contributed to it, is not yet discoverable by any method. It is otherwise with the first case; a Resultant may be analyzed, mentally if not actually, and its components may be assigned to the corresponding components of the Cause, by what is called the Deductive Method.

By the same method we must estimate the action of an unknown or hypothetical Cause.

The Deductive Method.

The Deductive Method has, according to Mill and Prof. Bain, three stages: *

1. Induction: the nature and power of the several Part-Causes contributing to the composite

* Mill: Logic; Book III. ch. xi. Bain: Logic; Book III. ch. x.

Effect must be known or discovered (or supposed); and this must be ultimately by Induction (or Hypothesis).

2. Deduction: the Effect which these Part-Causes would have in a certain combination must next be computed.
3. Verification: the computed Effect must be compared with the real Effect which was the starting point of the investigation. If these agree, there is so much evidence that we know the Causes and how they are combined; and this would be conclusive, but for the Vicariousness of Causes. If they do not agree, there must be an error somewhere: either (i) we do not know the right Causes, or not all of them, or have assumed too many, or a wrong combination of them; or (ii) have not rightly ascertained by Induction their nature and power; or (iii) have made some mistake in the Deduction.

Suppose we see E, an instance of a composite Effect, which we wish to trace to its Cause or Conditions. If it is not even known what the Conditions are, we must guess them: this is a hypothetic Subsumption; * by certain marks the Instance is tentatively classed either exactly or analogically with other known Instances. Next taking the Causes to be A and B, we learn by Induction or otherwise

* § 33.

(ultimately by Induction) the general nature and power of each—say a and b—, and thence compute by Deduction their combined Effect in this particular case—say $(a + b)$. The Effect $(a + b)$ thus anticipated is then compared with E: if they agree, we know that A and B so combined are a possible Cause of E; and if they account for E in general, and no other Cause is equally probable, they are at last taken to be the Cause. But if $(a + b)$ and E do not agree, we must retrace our steps and look for error as above indicated.

So much then as to the methods of investigating the coherence of Causal Instances: in an Essay of this kind so much may suffice. For a more complete account the reader, who may not yet be acquainted with the treatises of Mill and Prof. Bain, is referred to those works.

22. *Probation of Classes of Substances and Individuals.*

The probation of Classes of Substances and the probation of Classes of Individuals may be conveniently dealt with together. In so far as the probation of Classes of Individuals consists in testing the coherence of Coexistent qualities, it proceeds by the same methods, justified by nearly the same considerations as the probation of Classes of Sub-

stances. In the case of Individuals there is indeed a Succession as well as a Coexistence of properties to be considered, but sufficient evidence of the Succession of properties will often be found in the process of testing the coherence of the Coexistent properties. If other proof be required, it can only be conducted by the methods of testing Causation. Thus the Probation of Classes of Individuals presents no new problem, but only combines the two problems furnished severally by Causal Instances and Substances.

23. *Probation of Coherent Coexistence.*

We come then to consider the means of testing the constancy of Relations of Coexistence. And here there are no such resources of method available as in the inquiry concerning coherence of Succession. For those resources were derived from the Law of Causation in general, to which all particular cases of Causation might be affiliated; and there is no comparable Law of Coexistence in general, to which all particular cases of Coexistence can be referred. Relations of coherent Coexistence have no common marks which permit them to be defined universally and recognized by infallible signs: they agree only in being coherent, and this is the point we have to discover. Thus every case of coherent Coexistence must be received upon some kind of evidence not

applicable to all cases: it does not follow that each case presents an isolated problem.

Constancy of Relationship which cannot be proved by reference to some axiom, must (as before remarked) depend on an inferior amount of evidence of the same kind as that by which the axioms are themselves established; that is, upon uncontradicted agreement in experience, with the presumption of Nature's uniformity. Agreement in experience sufficient to establish an axiom may be said to give certainty; less evidence gives only some degree of probability. Hence if each case of Coexistence has to have its coherence tested by simple agreement in experience, or without the sanction of an axiom, none will be more than probably constant, and very few will be so in a high degree.

Cases of Coexistence however are not entirely isolated. Although as a class they have no common quality, but the one to be discovered, they may be grouped into subordinate classes of richer attribution. The device of subdivision already resorted to in order to define more fully the Rule of Quadriterminal Correlation in general, must now again be adopted with regard to this class of Quadriterminal Correlations namely, Correlations of Coexistences. The chief subordinate classes are: 1. Coexistence dependent on Causation; 2. Coexistences which establish Natural Kinds.

24. *Coexistences due to Causation.*

Many cases of Coexistence are consequences of Causation: and so far as Coexistence is a result of Causation, it has the coherence and certainty which belong to all Relations implicated in Causal Instances; contingent only on the existence of the Cause. Of this nature, says Professor Bain,* are the numerous Coexistences of Order in Place, which are always the redistribution of some prior distribution; and we shall see that there are other cases besides these. Indeed it is possible that all Coexistences are ultimately due to Causation; and it is hardly too much to say that this is a regulative principle of Philosophy: for Philosophy seeks complete generality, and this is not attained so long as there are two distinct kinds of coherence, by Succession and also by Coexistence. We cannot hope however to render the facts of Coexistence perfectly intelligible. Could we explain all present Coexistences by reference to some past state of the Universe and Causation; still, following the regress of Causes further back, we must come at last to Chaos. For the earliest discoverable distribution of existences was, so far as our understanding reaches, accidental; and from this taint of the incomprehensible, its consequences can never be wholly free.

* Logic: Book III. ch. iii. § 1.

25. *Natural Kinds.*

Mr. Mill's doctrine that Kinds have a real existence in Nature, also does something to relieve us of the distraction of regarding all coherence of Coexistence as only to be tested by exhaustive enumeration of particulars. "There are some classes the things contained in which differ from other things only in certain particulars which may be numbered, while others differ in more than can be numbered, more even than we can ever expect to know." This distinction agrees generally with that between Artificial and Natural Classes. The members of a Natural Kind agree among themselves, differ from the members of other Kinds in a multitude of qualities. Attribution conferred by numerous qualities, then, is the mark of a Kind, and therefore a mark of the coherence of those qualities which confer the attribution; if we find a few specimens agreeing in qualities so numerous, we may expect to find the same qualities cohering in the same way throughout an indefinitely extensive constituency. Still the principle is a little vague; and unfortunately it does not gain much in definiteness, while it loses in generality, if again we subdivide Natural Kinds into the Organic and Inorganic, and consider these separately.

1. The Inorganic Natural Kinds are, first, the sixty and odd Chemical Elements. These are the only Inorganic Kinds, and the only Substances, presenting

at present the pure problem of Coexistence. All compound Substances are derivative and resolvable, and the Coexistence of their qualities is partly a problem in Causation. Thus as marks of the coherence of attributes in primary Inorganic Kinds we have the mark of Kinds in general, and also Irresolvability. But Irresolvability is relative to the state of Science.

2. The Organic Kinds are the Species of Plants and Animals; and what constitutes a Species perhaps Naturalists may one day be able to decide; for Mr. Darwin says,* that "every Naturalist knows vaguely what he means when he speaks of a Species." There will then be assignable marks of an Organic Kind, besides those of Kinds in general; and these will be further marks of coherence. However, in the coherence of the qualities of all Organic Kinds Causation is involved: what is known of generation and heredity forbids the supposition that an Individual apparently representing such a Kind may be a solitary specimen. And as the nature of the specimen, so the existence of Organic Kinds in general, is deducible from Causation; for the theory of Natural Selection, which rests upon Causation, shows how, in the Organic World, Kinds of great uniformity must be produced by the destruction of varieties unsuited to the environment. Nor indeed

* Origin of Species, ch. ii.

will it appear incredible to the reader of Mr. Spencer's Chapter on *Segregation*,* that the existence of the Inorganic Kinds should hereafter be deducible.

Thus the coherence of the qualities included in the definition of any one Natural Kind, has the sanction of these wider definitions of Kinds, Organic, or Inorganic, and in general: and the wider definitions though not indeed so universal as the definition of Causal Instances, nor by any means so exact, are yet of very high generality, and in some sort affiliated to Causation itself. But the dependence of Kinds on Causation, whilst guaranteeing their sameness so long as the Causes which moulded them remain the same, also ensures their variation or destruction, should those Causes in a sufficient degree themselves vary.

26. *Superordinate Kinds.*

The comparison of Natural Kinds with one another reveals the possession of attributes in common; and hence arise Laws of Coexistence more general than the definitions of special Kinds, being definitions of higher Kinds, generic or other, that is, of Kinds of Kinds. Such for instance is the Coexistence of Inertia and Gravity, part of the definition of Matter, one of the higher genera of concretes. The qualities whose Coexistence is expressed in the definitions of

* First Principles, Part II. ch. xxi.

Superordinate Kinds are those which are least liable to incoherence in the members of Subordinate Kinds. For such definitions are generalized from the lower Kinds, and are thus supported both by the Doctrine of Kinds in many applications, and by much experience in detail; and, besides, the qualities they include are fundamental.

27. *Accidental Conjunctions.*

1. Contrasted with those qualities of a Substance or Individual which confer attributes on Superordinate Kinds, are those of its qualities which do not even enter into the definition of its own Kind. Of such qualities some (called Propria*) are derivable from the Kind-attributes and partake of their coherence; but others are not known to be in any way constantly coexistent with the other qualities; and these are called Accidents,* and in their Relations to the other qualities of the members of a Kind, or to one another, they may be said to be accidentally conjoined. To the constancy of such Conjunctions, the Doctrine of Natural Kinds extends no sanction; so that in their case we are reduced to probation by simple enumeration. By this means we may find an accident to be constantly concomitant with the attributes of a Kind within certain limits of observation, as the blackness of crows; or we may reach only an

* Ch. vii., § 11.

approximate generalization, as 'most metals are whitish.'

2. We may extend the name Accidental Conjunctions to certain other cases. Two or more qualities may happen to coexist frequently, or always, to an extent not conterminous with any Natural Kind or Kinds: such is the Non-coexistence of scarlet colour with scent in flowers. And here again since there is no general mark of the constancy of such Relations, we can only test it by simple enumeration of examples.

28. *Classification of Laws of Coexistence.*

It is only, I conceive, in these last two cases that simple enumeration alone is relied on for testing the coherence of Coexistences; but here no doubt it is desirable that every specimen should be examined. It is however, questionable, whether merely Accidental Conjunctions should be dignified with the name of Laws. Would it not be better to confine that name as regards Coexistence to the following cases:

1. Consequences of Causation.
2. Definitions of Summa Genera, where these are of Plural Attribution.
3. Coherence of Generic Attributes and part of the Difference of a Species with its remaining Difference; or of its whole Difference with the Generic Attributes.
4. Coherence of Generic or Specific Attributes with

Propria; which however may often be viewed as a consequence of Causation.

Laws of Coexistence, thus understood, are supported by an amount of evidence somewhere between axiomatic certainty and simple enumeration of examples.

29. *Causation disguised as Coexistence.*

Besides that cases of Coexistence are often due to Causation, some cases which seem to be of simple Coexistence, may really be of direct Causation. In such cases, according to Prof. Bain,* the means of distinguishing Causation from Coexistence are chiefly two: 1, to try to detect sequence in the apparently simultaneous; 2, to trace expenditure of energy.

30. *Definition and Probation.*

The process of Probation by simple enumeration is a continuation of that process of collecting examples which is preparatory to Definition. The same process is likely to bring to light whatever cases exist suitable for the employment of the other Probative methods. Definition is thus a preparation for, and an aid to, Probation; and in return Probation aids Definition. For a first Definition is not likely to be perfect. To say nothing of the connotation of common names, the

* Logic: Book III. ch. vi. § 2.

early Definitions of Science are nearly always subject to much dispute and modification. After the first tentative Definition of a Class by finding Terms with common qualities, the work of Probation sets in; the coherence of these common properties has to be tested. The result may be that some Relations supposed to be constant break down, whilst other Relations suggest themselves as more constant. The work of Definition then takes a fresh start: and so on. Thus by a continuous and alternative process of Definition and Probation, Classes are discovered and established.

31. *Laws.*

The result of definition is a Definition itself. Certain attributes are fixed upon as marking a Class, because the corresponding qualities are common to certain Terms. When disregarding the Class and its Constituents, we fix our attention upon the Qualities themselves and their Coherence, we are said to contemplate a Law. Coherence may be of Succession or Coexistence; and as there are Terms and Classes, so there are Laws based upon these Relations,—Laws of Succession, Laws of Coexistence, and of course Laws of the combination of these Laws.

Classes may be more or less extensive, and so Laws may be more or less general. The most general Laws or Axioms are called Ultimate; the less general Secondary: and Secondary Laws are either

Derivative or Empirical. Laws are said to be Derivative when they can be shown to be special cases of Ultimate Laws. Empirical Laws are generally believed to be special cases of Ultimate Laws, but cannot yet be shown to be so. And it is usual to consider all Laws of Coexistence, except those which can be derived from Laws of Causation, as Empirical; though perhaps Imperfectly Derivative would be a better name for the Laws of Natural Kinds. In short, Laws, being only Definitions, or parts of Definitions, differently viewed, are discovered, tested, and valued by the same rules.

32. *Explanation.**

To establish a Class or a Law is to generalize, to find similar Relations obtaining amongst similar Terms in an indefinite number of cases. The same process which is Classification as to the generality of the Terms concerned, and the discovery of a Law as to the Relations of their properties, is called with regard to any particular Term or Terms referred to the Class or Law, Explanation. Explanation is thus implicated in the Definitive-Probative process. When Classes are classified, and thereby higher Laws discovered, there is a further step of Explanation.

Mr. Mill found three modes of Explanation:

* Mill: Logic; Book III. ch. xii. Bain: Logic; Book III. ch. xii.

1. "Explaining a Joint-Effect by assigning the Laws of the separate Causes;" as when the course of a projectile is shown to be due partly to the energy of its discharge, partly to gravitation, partly to the resistance of the air.

2. Explaining "by discovering an intermediate link or links between an Antecedent and Consequent;" as when the scientific supplements the popular view of a Causal Instance by finding in it a series of Causal Instances.

3. Explaining several Terms by merging them in one Class or Law, or several Classes or Laws by merging them in one more general.

All these modes of Explanation involve generalization: 1. A Joint-Effect is a special case of the concurrence of Causes which may exist apart, or in other combinations. 2. The more a Causal Instance is narrowed, the less liable it is to interruption, and the more frequently it will occur in its completeness. 3. The third mode is, as Prof. Bain remarks, "generalization pure and simple."

When a phenomenon is explained by being likened to many others, it may often happen that amongst the many some are commoner or better known than the first phenomenon. In such cases the phenomenon in question is not only explained but familiarised. This, however, is by accident. The phenomenon is familiarized not by generalizing its properties, but by specializing them; not by showing the extent of

their prevalence, but by finding resemblances in this or that particular case. To confound Explanation with familiarization, generalization with specialization, is perhaps the fallacy of fallacies, of which anthropomorphism or heautomorphism (if I may be allowed the expression) is the Hydra-headed example. There is an egotism of intelligence, as well as of desire; and it is equally at enmity with Philosophy.

33. *Subsumption.*

When Classes and Laws have been established new instances may be discovered and recognized as coming under them. To this process I propose to restrict the name, Subsumption. Subsumption is a kind of Explanation; but whereas Explanation of some kind is involved in the Definitive-Probative process; Subsumption supposes that that process has been to a certain extent completed, that Classes have been already established; and is itself the process by which it is determined whether a given Term is, or is not, included in a given Class, or whether a given Class is, or is not, included in a higher Class. This involves at some stage the particular examination of the Term or Class to be subsumed; in order to find, in the case of Terms, whether they have the qualities common to the constituents of the Class in which it is proposed to include them; in the case of a Class, whether its

attribution includes the attribution of the Class under which it is to be subsumed. In other words (and this may throw light upon future passages) the Subsumption of one Class under another, involves a recognition of the Concomitance in the lower Class of those attributes in which the two Classes agree with those in which they differ (generic and differential attributes): thus if Cat is subsumed under Animal, we have—

$$\text{Felinity}\underbrace{\quad\omega\quad}\text{Animality.}$$

Similarly, the conclusion that of two Classes neither can be subsumed under the other, involves a recognition of the Nonconcomitance of their reciprocally differential attributes: thus if Cat is not subsumed under Dog, nor Dog under Cat, we have—

$$\text{Felinity}\underbrace{\quad o\quad}\text{Caninity.}$$

We must note, however, that a positive Relation, ω or ωv, between the Attributions of different Classes can seldom be simply converted, like the same Relation between Single Terms, or between Qualities in the Members of one Class. Animality $\underbrace{\ \omega\ }$ Felinity is only true within the Class of Cats. Animality in general is two Terms in relation to Felinity; one of which does, and the other does not coexist with it.

Definition and Probation then are the processes by which Classes are discovered and established, whereby

at the same time Laws are formulated and proved, and particular phenomena explained. By Subsumption fresh members, or components, or instances of known Classes and Laws are recognized and referred to their own. And Subsumption may be Immediate or Mediate: it is Immediate when the Relation of a new Term or Class to the Class under which it is to be subsumed is directly investigated; Mediate when its Relation to the subsuming Class is proved by its Relation to another Class, whose Relation to the subsuming Class is known. Plainly Subsumption is a mode of Probation, and Subsumption under an Axiom is the most perfect Probation.

I have used the words Induction and Deduction as little as possible, and would gladly see Logic freed of both. They are names, I conceive, not of modes of proof, but of modes of inference—of modes of inference which differ in the comparative extent of their data and conclusions—and in this sense Mr. Spencer uses and defines them.* Of course in order to proof there must generally be an inference to be proved; but whether an inference be inductive or deductive, it must be proved in the same ways: a deductive inference may be susceptible only of empirical proof, and an inductive inference may be demonstrable. N. B.

In Logic, too, the departments usually called Inductive and Deductive have had their boundaries

* Psychology: Part VI., ch. viii.

much blurred, and Induction has come near to be confounded with empiricism. Thus Prof. Bain says that the Experimental Methods, which used to be called Inductive, are Deductive. And this, I think, must be manifest to everyone; or is there any reason why Subsumption under the Axiom of the Syllogism should be called Deduction, rather than Subsumption under the Axiom of Causation? But if Induction is deprived of the Experimental Methods, little else than simple enumeration remains to it.

We now come to the subject of the Relations of Classes, the substance of nearly all Scholastic Logic. There are two leading questions: 1. Given any Immediate Relation of Classes, to find all the Equivalent and Implicated Relations between them; 2. Given any Relations between more than two Classes, to find under what conditions other definite Relations are implicated.

CHAPTER VII.

OF THE IMMEDIATE RELATIONSHIP OF CLASSES.

1. *Inclusion and Exclusion.**

THE Relationship of Classes considered in Logic is with respect to the identity or nonidentity of the Terms which constitute them. Two or more Classes may have many Terms in common, or they may have none. Perhaps then it would be more correct to speak of Classes so related as Coincident or Nonco-incident; but we shall obtain greater facility and flexibility of expression by calling them Inclusive or Exclusive. Inclusion and Exclusion may be regarded as the forms of Class-Relationship.

A Class is said to include another Class, if it includes in its Constituency the Constituency of the other Class, and to exclude another Class, if it does not include in its own Constituency any Constituent of the other Class. Sometimes if we could count the constituency of a certain Class, we should all the while be counting the constituency of another Class; then the first Class is included in the second. Some-

* Cf. Leibnitz: Definitiones Logicae.

times if we could count the constituency of a certain Class we should not all the time count a single constituent of a certain other Class: such Classes exclude one another. Thus, if we could count all the cats in the world, we should all the while be counting animals, but never any dog: cats are included by the Class Animal, and excluded by the Class Dog.

Again, Inclusion and Exclusion may be either Total or Partial. The Terms of one Class may be identical with a part of the constituency of another Class, but not with the whole: the first Class then partly includes and partly excludes the second. The Class White-animals includes some cats and excludes others. It is supposable that we should know exactly how many of one Class were included or excluded by another: 9999 cats might be white animals. Such information, however, is not to be had in the case of Natural Classes, but only sometimes in the case of Artificial Classes; we might ascertain, for instance, that out of 12 town-councillors 9 were publicans. Or we might know that half, or more, or less than half of one Class were members of another. And De Morgan and Hamilton have proposed to take account of these more definite modes of Partial Relationship; but they have not been generally recognized by Logicians. It is usual only to take account of Total, and indefinitely Partial Relationship, and to express the former by the signs *All* and *No* (*All* cats are

animals, *No* cats are dogs); the latter by *Some*. That is, whenever it is not known that the whole of one Class is included or excluded by another, though a part of it certainly is; this is signified by saying *Some* are (*Some* cats are white, *Some* animals are not cats).

2. *Knowledge and Reality.*

We must distinguish three conditions of a phenomenon:

1. As it really is;
2. As we know it;
3. As our knowledge of it is expressed.

With the third condition Scholastic Logic is largely occupied, but it properly belongs to Rhetoric, and we avoid the consideration of it here as much as possible. We endeavour to deal with the Relations of Classes themselves: but of course this is only possible in so far as those Relations are known to us. Between our knowledge of a Relation and its reality there may be a great hiatus. A Class may totally include another whilst we are only informed of a Partial Inclusion, or even of a Partial Exclusion. We must judge according to our knowledge and make allowance for its possible shortcomings. Hence what may be called the Rule of Continence: Assume no Relation to be stronger (more Inclusive, Exclusive, or Constant) than there is evidence for. N.B.

N.B.

On the other hand, since we can never know too much, I may add a Rule of Husbandry: Assume no Relation to be weaker (less Inclusive, Exclusive, or Constant) than there is evidence for.

3. *Designation.*

Any Relationship of Classes as known to us may be Indesignate or Designate. If we are told that the class Animal includes cats, but not whether the Inclusion be Total or Partial, the Relationship is Indesignate. If we know that *All* cats are animals, the Relationship is designated as Total by the word *All*. Thus *All*, *Some*, &c., may be called the Designations of Class-relationship.

Again, a Relationship may be designated in one or both Terms, may be Unidesignate or Bidesignate. '*All* cats are animals' is a Unidesignate; '*All* cats are *some* animals,' is a Bidesignate Relation ship.

By the Rule of Continence any Relationship in so far as Indesignate should be treated as Partial. It is said that cats are jealous; but unless it is affirmed that *all* are, we must assume that only *some* are. Where, however, a Class or part of a Class is given as excluded from another, it is excluded from the whole, although this be not expressed by designation. Thus *Some* animals are not fish, means that some animals are totally excluded from the Class Fish; or to express

the Relationship by Bidesignation, *Some* animals are not *any* fish. And this seeming breach of the Rule of Continence will presently be justified (§ 6).

4. *Qualitative and Quantitative Aspects of the Relationship of Classes.*

Plainly if the Inclusion and Exclusion of Classes be viewed altogether as a Relation between their Constituencies with respect to number, it is a Quantitative, and not a Qualitative intuition. Even if we only speak of *All* and *some*, and do not use numerical designations, the Relations in question are no less quantitative for being indefinite. However, although Logicians have usually talked of Classes as quantities of Terms, it was not this aspect of the Class which they really had in view. If they said, the Class A is included in the Class V, they meant not merely or principally that the Constituents of A are Constituents of V, but that the Constituents of A have the Qualities which confer Attributes on V: it is for this reason that they are (or are identical with) Constituents of V; and it is this Qualitative Relationship of A and V with which Logicians are ultimately concerned: the Quantitative Relationship they use as the implicated coincident and mark of the Qualitative. The constant concomitance of certain quantitative and qualitative Relations amongst Classes will presently be proved (§ 6), and thenceforth taken for granted.

5. *Conditions of Subsumption.*

1st. Subsumption of Terms.

We have seen that Classes consist of Terms in so far as these have qualities in common. When Classes have been formed, then, on the discovery of any new Term, the question arises, 'To what Class, or Classes, does it belong?' It might happen that the discovery of new Terms would lead to an alteration in existing classifications; but to examine this case would only be to return to the considerations of the previous Chapter: we here suppose that the new Term is a member of known Classes.

A Term is a Member of every Class whose Attribution is realized in its Qualities. Hence a Compound Term may be a member of many Classes: it is a member of as many Classes as it has qualities, for every quality is by its nature the basis of a Class; and may be a member of as many more Classes as there are possible combinations amongst its qualities. To ask to what Class a Term belongs is, then, to ask what its qualities are; and to find out this the Term must be examined, at least so far as to discover its fundamental characteristics, which are marks of the others. After examination it is subsumed under all the Classes whose attributions it realizes.

Or the question may be, 'Is the newly-discovered Term a member of this or that particular Class?' If on examination it is found to have the qualities which

confer attribution upon the given Class, or (in other words) to realize that attribution, it is subsumed accordingly. If however it has not the requisite qualities, it is excluded from the given Class, or (in other words) it is subsumed under the Counter Class.

2nd. Subsumption of Classes.

Since a Class is an assemblage of Terms, the process of subsuming Classes does not essentially differ from the process of subsuming Terms. In subsuming a Class indeed we have not to examine its constituents, for this has already been done whilst forming it. But as in subsuming a Term we discover its qualities, and observe what Classes have their attributions realized therein; so in subsuming a Class we take its attribution as defined, and observe what other Classes have their attributions contained in it. And a Class is subsumed under all other Classes, whose attributions are contained in its own attribution. Thus a Class of Plural Attribution may be subsumed under many other Classes: it is subsumed under as many Classes as there are distinct attributes in its attribution, for each of these is the attribution of a Class; and it may be subsumed under as many more Classes as there are possible combinations amongst its attributes.

On the other hand, a Class which is not subsumed under another Class (nor subsumes it) is excluded from

that other Class, inasmuch as it has not that Class's attribution;—is excluded from the other Class, or subsumed under the other's Counter Class.

These remarks apply to the subsumption of a Class as a whole; but a Class may also be partially subsumed by the subsumption of some of its Terms.

6. *Propositions concerning the Necessary Concomitance of certain Relations between the Constituents and Attributes of Classes.*

a. Inclusive Relationship.

1. If there be two Classes of unequal attribution, and one of them possess all the attributes of the other, the Class of lesser attribution includes the constituents of the other Class, and has other constituents besides.

Suppose two Classes A and V of unequal attribution; let A have the lesser attribution, and let V have all the attributes of A and some besides: the Class A includes the constituents of V and other members besides.

For the constituents of V, having the qualities which confer attributes on A, are constituents of A.

But the constituents of V cannot be the whole constituency of A, for then they must confer on A the whole attribution of V, which is contrary to the hypothesis.

2. If there be two Classes of unequal constituency, and one of them include all the members of the other, the Class of lesser constituency possesses the attribution of the other Class and other attributes besides.

Suppose two Classes, A and V of unequal constituency; let V have the lesser constituency, and let A include all the members of V and some besides; the Class V possesses all the attributes of A and other attributes besides.

For the constituents of V, being constituents of A, have in common the qualities which confer attributes on A, which therefore must be also attributes of V.

But the attribution of A cannot be the whole attribution of V, for then the constituents of A would all be constituents of V, which is contrary to the hypothesis.

Corollary i. There cannot be two distinct Natural Classes which wholly coincide either in attribution or in constituency; for such Classes coincide both in attribution and constituency, and are the same Class.

ii. If there be two Classes, and some constituents of the one have the qualities which confer attribution on the other, these Classes partially at least include one another.

iii. If there be two Classes which partially include one another, the constituents common to

both have the qualities which confer attributes on both.

β. Exclusive Relationship.

1. If there be two Classes, and no constituents of the one have all the qualities that confer attributes on the other, these Classes totally exclude one another.

   For if any constituent of either Class were a member of the other, it must have the qualities which confer attribution on the other.

2. If there be two Classes that totally exclude one another, no constituent of either can have all the qualities that confer attribution on the other.

Corollary i. If there be two Classes, and some constituents of the one have not all the qualities that confer attribution on the other, the one Class is partially (at least) excluded by the other.

ii. If there be two Classes, and one partially excludes the other, some constituents of the latter Class cannot have all the qualities which confer attribution on the former.

These propositions and corollaries explain why a Class, or part of a Class, given as excluded by another, is understood to be totally excluded by it. For if a Class, or part of a Class, be excluded by another, it is

because the constituents of the former Class, or some of them, have not the qualities which confer attribution on the second Class; and Terms which do not realize the attribution of a Class cannot be any part of it.

We see, then, that certain quantitative Relations between the Constituencies of Classes, are constantly concomitant with certain qualitative Relations between their Attributions. *Subsumed under* always means *contained in; subsumed under the Counter Class* always means *excluded from the Positive Class:* and so on. Hence it is not material which Relation be made explicit; the concomitant Relation is always implicit; one is a mark of the other: but the quantitative Relation is more convenient to deal with.

7. *Unidesignate Relationship.*

Of the Unidesignate Relations of Classes, Logicians have usually recognised these four:

1. Total Inclusion
   All A is V . . . . . A
2. Total Exclusion
   No A is V . . . . . . E
3. Partial Inclusion
   Some A is V I
4. Partial Exclusion
   Some A is not V . . . . O

The letters on the right hand are the symbols commonly used to denote the Relations which they respectively stand over against.

We have next to discover all that is involved in the Relations thus given. And it may be observed that in Unidesignate Relations the designation *Some* is here taken to mean not *Some only*, but *Some, it may be all*, or *Some, it may be none*, according as the Relation is Inclusive or Exclusive; or, briefly and generally, *Some at least*.

8. *Comparison of Unidesignate Relations of Classes.*
1*st. Implication.*

Understanding Relations to Coincide when they tie the same pair of Classes: a Relation may be defined to Implicate another when that other *must* coincide with it. Such Implication springs directly from the nature of a Class as a Whole or Sum of Parts. Many other branches of the Science grow more or less directly from the same root: indeed the Relation of Whole and Part is, if I may so express it, the principal schema of all this latter part of the subject. And perhaps it will be as well to state explicitly some principle similar to Euclid's so-called Axiom, "The Whole is greater than its Part:" as, for instance, The Whole includes every Part; or, The Whole is identical with the Sum of its Parts.

As a whole in relation to parts, a Class may be

regarded in relation to its Constituents or to its Attributes.

α. Class and Constituent.

(*a*) Direct Implication.

1. A Class which includes (or excludes) the whole of another Class, includes (or excludes) every constituent or part of it. Hence

i. A implicates I.

For if *all* the members of A be members of V, *some* must be.

ii. E implicates O.

For if *all* the members of A be excluded from V, *some* must be.

(*b*) Inverse Implication.

2. A Class which does not include (or exclude) part of another Class, cannot include (or exclude) the whole. Hence

i. If I do not obtain, A cannot.

ii. If O do not obtain, E cannot.

One Constituent or Part of a Class, as such, implies other Constituents or Parts, or another Part; which therefore may be called the Counterpart.

β. Class and Attribute.

(*a*) Direct Implication.

3. A Class which has all the attributes of another Class, has each, or any, of them.

(*b*) Inverse Implication.

4. A Class that has not some attributes of another Class, cannot have all.

2nd. Compatibility.

Relations of Classes that *may* coincide are Compatible.

The Compatibility of certain Relations of Classes depends partly on the vagueness of the partial designation, partly on the nature of the case.

i. I is compatible with A.

For if some members of A be members of V, we do not know but that all are so.

ii. O is compatible with E.

For if some members of A be excluded from V, we do not know but that all are excluded.

In these two cases the Compatibility of the Relations depends upon the circumstance that *Some* may mean *All*: if it should prove to mean *Some only*, the Compatibility would be destroyed.

Again:

iii. I is compatible with O.

For though some members of A be members of V, others may not be so.

iv. O is compatible with I.

For though some members of A be excluded by V, others may be included.

In these two cases the Compatibility of the Relations depends upon the circumstance that *Some* may mean *Some only*: should it prove to mean *All*, the Compatibility would be destroyed. I and O, then are compatible, if the whole truth concerning the Rela-

tions of the two Classes be already known; I and A, O and E are compatible only on the supposition that the whole truth is not known.

3rd. Incompatibility.

Relations of Classes that *cannot* coincide are Incompatible. Thus:

i. A is incompatible with E.
For if all the members of A be included by V, none can be excluded.

ii. E is incompatible with A.
For if all the members of A be excluded by V, none can be included.

If either A or E obtain between two Classes, then the other cannot; but Relations may obtain between two Classes which are neither A nor E, nor yet imply them: namely, I and O.

Again:

iii.	A is	incompatible	with	O
iv.	E ,,	,,	,,	I
v.	I ,,	,,	,,	E
vi.	O ,,	,,	,,	A

All these Incompatibilities are implicated in the Incompatibility of A and E, but do not, like those Relations, admit a third case.

Incompatibility may also be viewed as Obverse Implication; since either of two Incompatibles, whereever it obtains, implicates the absence of the other.

4th. *Alteruternity.*

It of two conceivable Relations between Classes *one must* obtain, but *both cannot*: this is Alteruternity. Thus A and O are incompatible, but

If A do not obtain, O must:

for if E obtain, it implicates O. And similarly

If E do not obtain, I must:

for if A obtain, it implicates I. And so conversely.

If of two Relations between Classes *one must* obtain, but *both may* do so: this is Imperfect Alteruternity. Thus I and O are compatible, but

If I do not obtain, O must:

for if some members of A be not included by V, they must be excluded.

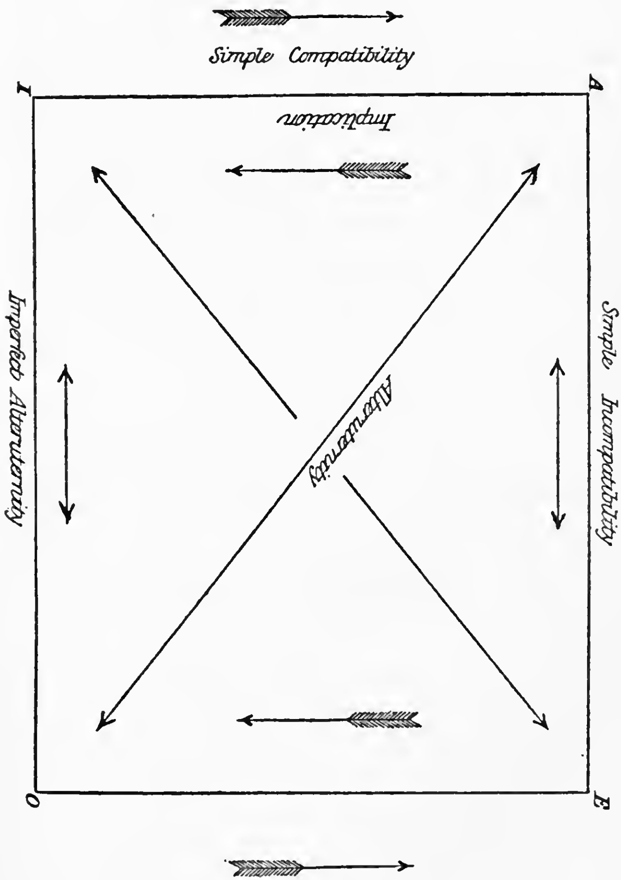
If O do not obtain, I must:

for if some members of A be not excluded by V, they must be included.

5th. *Square of Comparison.*

The famous Square of Opposition may be a little modified and called the Square of Comparison; since "opposition" is too strong a word, and very misleading. Relationships of Implication, or Compatibility, cannot be regarded as Opposition, unless in the sense that the symbols of the Relations compared are placed opposite one another; and to base a technicality on

such a paltry circumstance, is to throw opportunity out of window, and open the door to misunderstanding.



9. *Equivalent Aspects of Unidesignate Relations.*

1*st. Obverse Relationship.**

We have seen that any Class and Counter Class together include the sum of possible Terms. Any other Class, then, being constituted of Terms, must be included either in the Positive Class, or in the Counter Class, or partly in one, partly in the other. Hence any direct Relation of one Class to another Positive Class, implies an obverse Relation to it, that is, a Relation to its Counter Class. These direct and obverse Relations are equivalent, and we may use whichever suits our purpose.

The letter which stands as the symbol of a Class, may with a stroke before it represent the Counter Class. Thus if A be a Positive Class, the Counter Class will be /A.

Propositions of Obverse Relationship.

1. In so far as a Class is included in a Positive Class, whether wholly or partially, it is excluded from the correlative Counter Class, or Classes.

   A. If *all* A is V, *No* A is /V.
   I. If *some* A is V, *Some* A is not /V.

2. In so far as a Class is excluded from a Positive Class, whether wholly or partially, it is in-

* Bain's Logic, Book I., ch. iii., § 27.

cluded in the correlative Counter-Class, or Classes, or some, or one of them.

E. If *no* A is V, *All* A is /V.

O. If *some* A is not V, *Some* A is /V.

As any Relation to a Positive Class implies a Relation to the correlative Counter Class; so any Relation to a Counter Class, implies a Relation to the correlative Positive Class. And as the direct Relations are symbolized by A, E, I, O; the corresponding obverse Relations may be represented (like the Counter Class) by the same letters with a stroke before each, thus: /A, /E, /I, /O.

3. In so far as a Class is included in a Counter Class, whether wholly or partially, it is excluded from the correlative Positive Class.

/E. If *all* A is /V, *No* A is V.

/O. If *some* A is /V, *Some* A is V.

4. In so far as a Class is excluded from a Counter Class, whether wholly or partially, it is, or is included in, the correlative Positive Class.

/A. If *no* A is /V, *All* A is V.

/I. If *some* A is not /V, *Some* A is V.

2nd. Converse Relationship.

A Relationship between two Classes does not always affect both in the same way; and it is important to note the different ways in which the two Classes are respectively affected in different Relations; since some of them are liable to be misread

by negligent observers. Any Immediate Relation between two Classes may be viewed from both sides: either side being taken, the Relation thence regarded may be called Direct; and from the point of view of the other Class, the Relation will then be seen in its Converse. The Relationship itself is not altered by our point of view, and therefore we may take whichever suits our convenience.

A. A Class totally included in another Class, includes at least a part of that other. Hence

If *all* A is V, *Some* V is A. (1.)

This is the usual mode of viewing the Converse of A: it is called Conversion by Limitation, because the correlative V, being indesignate, is taken partially, according to the Rule of Continence. Unfortunately, however, there is a custom by which a Relationship once unidesignate, must be always unidesignate; and so V having now been designated, the Class A loses its designation. The result is that the Class A, now indesignate, is also limited; and if we attempt to reconvert the Converse of A (the Relation), we get not A itself, but only I:

If *some* V is A, *Some* A is V—(*infra* Prop. I.)

This
an object
to ordinary
view

Thus by viewing the Relationship on both sides we seem to lose a part of our information concerning it; although the Relationship itself is certainly not thereby altered. The usual mode of converting A by Limitation merely, is therefore contrary to the Rule of Husbandry; and since this Rule seems more

profitable than the custom of preserving the unidesignate character of Relations, I propose a second mode of converting A, to be used whenever convenient; which may be called Conversion with Bidesignation—thus:

If *all* A is V, *Some* V is *all* A. (2.)

E. Total Exclusion between two Classes is reciprocal. Hence

If *no* A is V, *No* V is A.

I. Partial Inclusion between two Classes is reciprocal. Hence

If *some* A is V, *Some* V is A.

This treatment of E and I is called Simple Conversion, because the designation of the Relationship remains the same. Nothing is lost by leaving the Class A indesignate in the Converse; for we have seen that in E the correlative Class is taken totally; and in I, where it is taken partially, that is all we know.

O. This Relationship is so indefinite that it does not admit of direct Conversion, if we insist on preserving its unidesignate character. For if *Some* A is not V, it may be that *No* V is A, or that *All* V is A, together with the implications of these possibilities. Accordingly, the usual practice is to convert the Obverse of O, and to this process we shall come presently. Here we propose to resort, as in the second Conversion of A, to Conversion with Bidesignation—thus:

A Class which excludes a part of another Class, is itself by that Part-Class wholly excluded.

If *some* A is not V, *No* V is *some* A.

3rd. Converse of Obverse Relations.

Obverse as well as Direct Relations may be viewed from the side of either Class, and are converted on the same principles as the formally-equivalent Direct Relations, thus:

/A, like E.	If *no* A is /V,	*No* /V is A.
/E, like A.	If *all* A is /V,	*Some* /V is A (1).
	. . .	*Some* /V is *all* A (2).
/I, like O.	If *some* A is not /V,	*No* /V is *some* A.
/O, like I.	If *some* A is /V,	*Some* /V is A.

This last Relationship, *Some* /V is A, is usually taken as the Converse of O, and together with all the above Converse-Obverses, is said to be obtained by Contraposition.

It is an obvious extension of this discussion to consider the Obverse of Converse Relations; but we should meet with no novelty, except in the bidesignate Converses of A and O; and these will be examined when we come to the Obversion of bidesignate Relations in general.

10. *Genus and Species.*

If of two Classes of unequal Constituency, one includes the other, they are called in relation to one

another Genus and Species; that is to say the including Class is called the Genus; and the Class included, the Species. By Prop. a, 2, § 6, this is equivalent to saying that the attribution of the Genus is less than and included in the attribution of the Species. In Logic these names are not necessarily confined to Natural Classes, but may denote any Classes standing to one another in the defined relation: we shall however gain in definiteness by keeping an eye on Natural Classes.

Genus and Species are said to be respectively higher and lower Classes. A Genus not included in any higher Genus, is called a Summum Genus; and the desire for the utmost possible generality of conception plainly aims at discovering one all-embracing and absolute Summum Genus. But it seems that there is none: there is none to those who follow Kant* and Prof. Bain† in not regarding simple existence as an attribute. By the definition of a Class, "all things" cannot be a Class, since there is nothing to distinguish it from. Or if it be contended that the attribute of existence is sufficiently contrasted with nonexistence, then nonexistence must also be an attribute; but the impossibility of this is shown by the absurdity of supposing such an attribute realized in any constituent. Instead of one

* Critique of Pure Reason: pp. 165-367 (Meiklejohn). Beweisgrund zu einer Demonstration des Daseins Gottes. Betracht. I. § 1.

† Bain: Logic; Book I. ch. iii. § 23.

Summum Genus, there are two coordinate Summa Genera, namely, Terms and Relations. To Prof. Bain's view, that Object and Subject are the true Summa Genera,* I cannot altogether subscribe; but no doubt they are the Summa Genera of Concretes.

A Species that includes no lower Species is called an Infima Species.

Between a Summum Genus and an Infima Species many Classes may stand in gradation. Each Class is a Species of any Class above it, and a Genus of any Class below it (and within it). Thus a Summum Genus is the Genus of a Species, which in turn is the Genus of a lower Species; and so on until we come to the Genus of the Infima Species.

The Genus next above any Species is called its proximate Genus.

11. *Of the Qualities which appertain to a Term with regard to its Subsumption.*

No Term is subsumed immediately and only under a Summum Genus, but is also a member of some lower Class; therefore of both a Species and a Genus. It realizes, then, in its qualities the attributions both of a Species and of a Genus.

The qualities of a Term which confer attributes on its Species, are called Specific qualities.

* Bain: Logic; Appendix C.

Of a Term's Specific qualities those which confer attributes on its Genus, are called Generic qualities.

A Specific quality (or qualities) not also Generic, may be called the Specific Difference (subordinately privative determinant of the Genus).

To these names of the qualities of a Term, there correspond names of the attributes of its Classes—Specific attributes, Generic attributes and Specific Differential attributes. And Specific Differential attributes should be carefully distinguished from the Differential attributes of which we spoke in the fourth Chapter, in as much as the latter were so called without reference to any particular Genus.

These three kinds of qualities and attributes are sometimes said to be Essential. The 'Essence' is a convenient name for those qualities of a Term on account of which it is subsumed under a Class: the Essence of a Class is its defining Attribution. In order that any quality may rank as part of the Essence, 1, it is requisite that it be ultimate or independent; or, rather, that it be not known to be dependent on, or derivable from, any other quality: 2, it is desirable that it be fundamental, or one on which other qualities depend.

The qualities appertaining to a Term besides its Essence in relation to any Class are either Propria or Accidents: and Propria are distinguished by this, that they belong to all the members of a Class by derivation from the Essence; whereas it is doubted

whether an Accident belongs to all the members, or it may be known that to some it does not belong.

A Proprium, then, like the Essence of a Term, belongs to it in common with all the constituents of the Class; but a Proprium differs from the Essence in that it is known to be derivable from, or dependent on, the Essence or some part of it. Thus Propria form no part of the Essence or Attribution of a Class, and are not included in a Definition; and so it is questionable whether they should be called Attributes; although it would seem that they ought to be, since they are qualities common to all the members. Perhaps it will be sufficient whenever there is danger of a misunderstanding, to signalize them as secondary or derivative attributes. Again, a Proprium may be dependent on the Generic attributes, and appertain to the Genus as a whole; and may then be called a Generic Proprium: or it may be dependent on the Specific Attributes only, and may then be called a Special Proprium.

Accident is the name given to a quality of any Term which neither ranks among its Essential qualities, nor is known to be dependent on them: such a quality may be peculiar to a few Terms of a Class or common to many; but it is not considered to appertain to a Natural Kind. Accidents are indeed said to be Separable or Inseparable from the members of a Kind; if members have been

known without the Accident, it is said to be Separable; if not, Inseparable. And with regard to Inseparable Accidents the questions arise: Why, since they are common to all known members, are they not appurtenances of the Class? Since they are not derivable from other qualities, why are they not considered Essential to the Class? The reason why Inseparable Accidents are not referred to a Class as a whole, appears to be some suspicion grounded in analogy, that if Nature were exhaustively known they would be found to be separable: this suspicion would naturally attach to a quality which had been known to be separable in relation to the Members of other Classes. But perhaps what generally draws this doubt upon a seemingly Inseparable Accident is want of fundamental character, where no other quality depends upon it. This defect would especially exclude a quality from Essential rank.

Accidents are, of course, never really accidental, but potentially derivable, if not from the essential attributes alone, from these in connection with circumstances; as is believed to be the case, for instance, with the colour of many animals. And on the other hand, it is not improbable, that wider knowledge will show many qualities now deemed essential, to be themselves derivative. So that the difference between Essential Attributes, Propria, and Accidents, is in some degree relative to the state of Science;

and what qualities are to be classed under each head, is in every case a question of special science.

Although Accidents do not appertain to Natural Classes, it is common to find Artificial Classes determined by qualities which would be Accidents in relation to a Natural Class. Inhabitants of London constitute a Class, whose attribution is the circumstance of living in that city; although to live in London is accidental to a man, and even to an Englishman.

Table of the Qualities appertaining to a Term.

- Qualities appertaining to a Term
  - Common to a Class
    - Underived and fundamental Attributes, or Essence . — Specific Attributes
      - Generic.
      - Specific Differential.
    - Derived from the Essence—Propria
      - Generic.
      - Special.
  - Neither fundamental nor derivable—Accidents
    - Inseparable.
    - Separable.

12. *Propositions concerning Genus and Species.*

1. A Genus includes a Species and more than a Species; or, a Species is only a part of its Genus. (*Def. of G. and S.*, § 10.)

It is understood of course that this discussion is of an abstract nature, and does not proceed on the supposition that its propositions will always represent the relations of concrete phenomena. In relation to concrete phenomena the principles of Logic are merely regulative—regulative, that is, not of the phenomena themselves but of our conduct in dealing with them. They define, I may say, the conditions of the intelligibility of phenomena, and in their imperative aspect direct us to seek in phenomena their own realization. Thus we are to seek in Nature, for every Species, a Genus including it and more; but it is not certain that we shall always find one. For instance, the fish, *Amphioxus*, is, I believe, a Species which is the only known representative of its Genus. It might indeed be said that this is due to the fixity of the names, Genus and Species, in a Zoological classification; but the abstractness of Logical principles is a better ground of reconciliation.

Those Terms by which the constituency of a Genus exceeds the constituency of its Species, may be called the Counter Species or the Special Counter Class. The Special Counter Class is of course to be distin-

guished from the Counter Class in general, which has no reference to a particular Genus.

Corollary: The general Counter Class of a Species includes the Counter Class of its Genus and other Terms besides (namely, the special Counter Class).

2. A Species includes the attributes of its Genus, and others besides.

3. The Differential Attributes of a Species, are Differential Privations of the Counter Species.

For if the constituents of the Counter Species possessed the qualities which confer the Specific Difference, they wonld be constituents of the Species.

4. If there be two Classes, and Part of one is included in, whilst the Counter-Part is excluded from the other Class, the Part of the former Class is a distinguishable Species of it.

Let A and V be two Classes such that a Part of A is included in, whilst the Counter-Part is excluded from V: the Part of A included in V is a distinguishable Species of A.

For the Part of A included in V must be so included on account of possessing attributes, which are privations of the Counter-Part; and these attributes, being additional to the attributes common to the Part, and Counter-Part, are Specific.*

* In Natural Classes these attributes to be Specific, must be of Essential rank: the Prop. is only true on this condition.

The Counter-Part is, then, the Counter Species.

5. The known Counter Species is either another Species, or several others.

For we have seen that a Term has more than its Generic qualities.

First, then, if all the constituents of the known Counter Species agree among themselves in a certain essential quality (or qualities) which is not Generic, the same is a Specific Difference; and the Counter Species, as a whole, is another Species.

Secondly, if not all constituents of the Counter Species, but only some of them, agree in a quality which confers a Specific Difference, these Terms constitute a second Species: and if any of the remaining constituents similarly agree, they constitute a third Species. Thus the Counter Species may consist of several Species.

Lastly, if in the Counter Species there be no two known Terms that agree in any Essential quality, that is not Generic; each Term may rank as a Species, and be called a Specific Instance.

Corollary: A Genus has more than one Species.

It appears to be an assumption of Logic, which may as well be explicitly stated, that Nature is

inexhaustible, or that the natural limits to the production of instances of any kind are unknown. Hence—

6. The number of Species in any Genus is indeterminate.

In any Genus, any Species, or number of Species being taken, the Terms (if any) by which the constituency of the Genus exceeds the constituencies of these Species, may be called the Remainder.

Species of the same proximate Genus may be called coordinate Species.

7. The sum of coordinate Species is identical with the Genus; or the constituency of the Genus is distributed among the Species without remainder.

> This follows from Prop. 4; for if there were a Remainder not groupable into Species, its constituent Terms must be Specific Instances.

The idea of Specific Instances is supported by the assumption of Nature's inexhaustibility; for though similar Terms should not be known, it does not follow that they do not exist; and in some cases what we know of the conditions of the existence of such Terms, is a guarantee that others of the same Species do exist, or have existed.

The Specific Difference of a Specific Instance can only be distinguished by analogy, or as the complement of its Differential Privations.

8. In any Genus the Species are mutually exclusive.

   For they are reciprocally Species and Counter Species.

Corollary: 1. A Species excludes part of its Genus; that is, the Remainder: or, is excluded by it.

2. Part of a Genus includes the Counter Species.

9. If two Classes be mutually exclusive they may, or may not, agree in some attributes, but cannot agree in all.

   They do not agree in all by Prop. β, 2, § 6.

   If Species of one Genus, they agree in their Generic Attributes.

   If Summa Genera, or exclusively included in different Summa Genera, they have nothing in common.

And here it may be remarked once more that although all Relations are Terms, Terminality is an Accident, and not an Attribute of Relations, for it is related to Relationality neither as fundamental nor as derived: else all Classes must have something in common.

10. A Class only partly included in (or excluded from) another Class, may or may not have some of its attribution, but cannot have all.

    Let A and V be two classes such that part of A is included, and part excluded by V.

1. A may be the Genus of V and possess its Generic Attributes.

2. A and V may be coordinate, but imperfectly differentiated Species (exceptions to Prop. 8), having the same Generic attributes, and some members of A being moreover marked with the Difference of V.
3. Supposably, A and V, as Classes, may have nothing in common.
4. But A cannot have all the Attributes of V, by Cor. ii., Prop. β, 2, § 6.

13. *Division.*

We saw in the preceding Chapter that the problems of Logic had to do with the discovery and arrangement of Classes. One of these problems may be stated thus: Given a Genus to find its Species. The process by which this is accomplished is called Division.

Three Canons of Division are usually given, which may be derived from certain propositions in the section concerning Genus and Species. Thus:

1. A Genus includes a Species and more. (Prop. 1 § 12.) Whence what may be called the

Canon of Limitation.

Each of the parts must contain less than that which is divided.

2. The sum of Coordinate Species is identical with the Genus. (Prop. 7, § 12.) Whence the

Canon of Consummation.

All the parts together must be exactly equal to that which is divided.

3. In any Genus the Coordinate Species are mutually exclusive (Prop. 8, § 12.) Whence the

Canon of Disjunction.

The parts must be opposed, that is, mutually exclusive.

These Canons help to test a Division already made, but do not tell us how to make it. To learn this we must fall back upon the considerations of the preceding Chapter. Division is the discovery, definition and probation of all the Species of a given Genus. The first step will be to assemble the constituents of the Genus. We then select a quality, or modification of a quality, appertaining to some of the constituents, and propose it as a Specific Difference. The selected quality should be essential, that is, fundamental and underived; and, of course, not one conferring an attribute on the Genus. Those constituents of the Genus which agree in this quality may form a Species.

The Species thus formed may be treated according to the Canons of Definition: 1. Assemble the constituents of the Species: 2. Assemble the constituents of the Counter Species; that is, those constituents of the Genus which lack the selected Difference. This rearrangement of the constituents of the Genus may serve two purposes: 1, it may

disclose a quality more fit to be made a Specific Difference, and thus lead to the formation of a more natural Species: 2, supposing the quality chosen to be the best, the segregation of Species and Counter Species, enables us to observe what other qualities or modifications of qualities are correlated with the Difference, and what with the absence of it. Then, when enough specimens have been examined, the Species is proved and defined; and the Counter Species also as to its privations.

This method is the celebrated Division by Dichotomy; which, as Prof. Jevons remarks, is the only method by which we can be sure of making a Division exhaustive. Indeed it insures a sound Division in every respect, so far as a sound Division exists in Nature, as we may see by comparing the results already reached with the Canons: 1. The Species and the Counter Species are each less than the Genus; 2, the Species and the Counter Species are together identical with the Genus; 3, the Species and Counter Species are mutually exclusive.

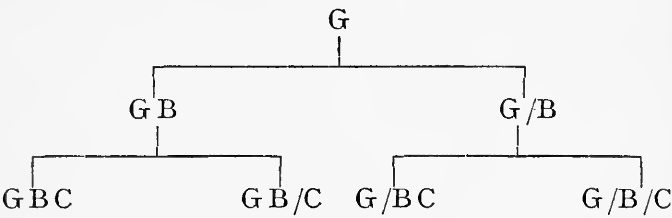
So far then, the Division is sound; and it is intuitively clear that a Division thus conducted must always be sound; but we have not carried the present one far enough. The Counter Species has been left in a very vague state, defined only by its privations. But by Prop. 5, § 12, the Counter Species is either itself a Species or several others; we must therefore look for the positive determinants.

The procedure is as before: a quality is selected,—which we will suppose to be the best—a quality underived, fundamental, and conferring attribution neither on the whole Genus, nor on the first Species. If the Counter Species be but one Species (save an unknown Remainder) this quality will be found to mark all its constituents. The correlated modifications are then noted, and the Species is defined. Or if the Counter Species contain more than one distinct Species, these have to be discovered severally in a similar way.

But we have not yet done. Returning to the case in which the Counter Species, or known Counter Species, was one Species, we observe that it had itself a Counter Species. The Counter Species of the second Species is twofold, comprising, 1, the first Species and, 2, an unknown Remainder. Now in either of these groups there may possibly be Terms which have not, and Terms which have the Difference of the second Species. As to the first Species it cannot be that all its constituents have the Difference of the second; but some of them may. As to the unknown Remainder, if any of its Terms have the Difference of the second Species, they are members of it; if not they constitute a further Counter Species to be treated as before.

The result so far may be exhibited in a diagram, borrowed from Prof. Jevons, and adapted to the notation of the present Essay. The groups of letters

stand for Classes; each letter for an attribute; and a letter with a stroke before it (/B) for the attribute regarded as a privation.



Here we have G the Genus to be divided: B is taken as the first Specific Difference; and so G B is the first Species, with G/B as Counter Species. As the second Difference C is taken, and G/B C becomes the second Species. The first Species is then logically represented by GB/C; and of the other two possible Classes, G/B/C is the assumed Remainder. A question arises as to the existence of G B C, which can only be decided (where C and B are compatible qualities) by examining GB Term by Term. It is a logical desideratum that GBC do not exist; for then, neglecting the unknown Remainder, we have GB/C and G/BC, coordinate and mutually exclusive Species of G. But if G B C do exist, the Divison will not run clear: for we have in fact G B C and G B/C, coordinate Species of G B; and G B C and G/BC, coordinate Species of GC. Such cases may occur: it is not the Logician's fault, but Nature's. And it is the double merit of Dichotomy to exhibit a perfect classification where it exists, and to expose

the shortcomings of Nature where a perfect classification does not exist.

For further discussion of this and allied subjects the reader is referred to Prof. Jevons' *Principles of Science*, Chapter XXX.

14. *Bidesignate Relationship.*

Bidesignate Relations are double the number of the Unidesignate. The following is a list of them with their respective symbols placed opposite.

1. Toto-total Inclusion
   All A is *all* V . . . . . A^2
2. Toto-partial Inclusion
   All A is *some* V . . . . . A
3. Parti-total Inclusion
   Some A is *all* V . . . . I^2
4. Parti-partial Inclusion
   Some A is *some* V I
5. Toto-total Exclusion
   No A is *any* V . . . . . E
6. Toto-partial Exclusion
   No A is *some* V . . . . . E_2
7. Parti-total Exclusion
   Some A is not *any* V . . . . O
8. Parti-partial Exclusion
   Some A is not *some* V . . . . O_2

The names of these Relations are taken from Sir W. Hamilton; the symbols, A^2 and I^2, from Mr.

Spalding: and in each of these symbols the figure 2, placed above the character indicates that the Relation thus denoted is a "better Relation" than the Unidesignates equivalent to the Relations still represented by A and I: and E_2 and O_2 are obvious imitations; where the figure 2, placed below the character in each case, indicates that the Relation so denoted is a "worse Relation" than the Unidesignates equivalent to the Relations still represented by E and O.

There have been doubts as to the Logical legitimacy of Bidesignation: it has been urged that as a rule we neither think nor speak in this form. But whether these objections be sound or not, they cannot excuse us for not treating the subject here. Bidesignation certainly most adequately represents the Relations of Classes as they exist in Nature; as we often seek, and often discover them. Indeed the Bidesignate Relations of Classes are involved in the doctrine of Genus and Species, and may be deduced from the Props. of § 12.

15. *Deduction of Bidesignate Relations.*

'A^2. The sum of coordinate Species is identical with the Genus. (Prop. 7, § 12.)

All G is *all* nS

Let A be a Genus, and B, C, D coordinate Species,

with Remainder X: if for (B, C, D, X) we substitute V, we may generalize the Relationship thus:

All A is *all* V.

'A. A Species is part only of its Genus (P. 1, § 12).

All S is *some* G;
or, *All* A is *some* V.

'I². A Genus includes a Species, and more (P. 1, § 12).

Some G is *all* S;
or, *Some* A is *all* V.

'I. This Relationship is exceptional: it occurs where P. 8, § 12 is not true; that is where coordinate Species happen not to be mutually exclusive.

Some S is *some* 2S (a second Species);
or, *Some* A is *some* V.

'E. Coordinate Species are mutually exclusive (P. 8, § 12)

No S is *any* 2S;
or, *No* A is *any* V.

'E_2. A Species is excluded by part of its Genus (P. 8, Cor. 1, § 12).

No S is *some* G,
or, *No* A is *some* V.

'O. A Species excludes part of its Genus (P. 8, Cor. 1, § 12).

Some G is not *any* S;
or, *Some* A is not *any* V.

'O_2. A Genus has more than one Species; that is, is divisible (P. 5, Cor. 1, § 12).

Some G is not *some* G,
or, *Some* A is not *some* V.

Or we may regard this Relationship as given in the Relationship complementary to 'I, for

If *some* S is *some* 2S,
Some S is not *some* 2S:

or else S and 2S would not be different Species.

It will be observed that in so far as Bidesignate Relationships are based on the doctrine of Genus and Species, the sign *Some* must be understood to mean *Some only* (semi-definite—Hamilton). But Bidesignation, although involved in the doctrine of Genus and Species, is not entirely dependent upon it. A Relationship of Classes may be given us with Bidesignation, in which *Some* signifies *Some at least;* and such cases may be called, Bidesignates detached from considerations of Genus and Species.

I will add something about the Comparison and Equivalent Aspects of Bidesignates of both kinds; but briefly, since this Chapter threatens to run to disproportionate length. To avoid confusion Relations based on the doctrine of Genus and Species may be denoted by symbols marked on the left side thus:

$'A^2$, $'A$, &c.; and their Terms (or terminal Classes) may be represented by G, S, 2S, &c.: whilst the symbols of detached Bidesignates may go unmarked, and their terms may be represented by the usual A and V.

16. *Obverse Aspect of the Relationship of Genus and Species.*

In connection with the doctrine of Genus and Species, the notion of a Counter Class acquires greater definiteness. The general Counter Class of any Positive Class may present a mere chaos of Terms without division or boundary. But the Counter Class of a Species, that is the coordinate Species, or the Remainder of the Genus, is a far more intelligible realm. We know some of the qualities of everything that can be found there. And De Morgan pointed out that it was not the general, but the special Counter Class, or the Remainder of some assumed Genus, which we always have in view, when referring explicitly or implicitly to the obverse correlative of any subject of thought or discourse. It is true he does not use this language; but instead of the Species and Counter Species of a Genus, speaks of contraries within an "Universe"—a new expression which seems scarcely needed. The Genus with its Species and Counter Species do not always correspond to Natural Kinds; but it is enough if the use of these words be Logically valid. Thus if

we speak of males with reference to the Counter Class females, we may rightly regard these Classes as Species and Counter-Species; for though male and female are not coordinate Species in Zoology, they certainly are in Logic.

Propositions Ampliative.

1. A Class which includes a Positive Class, not coinciding with it, includes a part at least of its Counter Class.

$$\text{If } \textit{all} \text{ S is } \textit{some} \text{ G, } \left\{ \begin{array}{l} \textit{Some} \text{ /S (general)} \\ \textit{All} \text{ /S (special)} \end{array} \right\} \text{ is } \textit{some} \text{ G.}$$

2. A Class which includes (or excludes) a Part only of another Class, excludes (or includes) the Counter Part.

If *some* G is *all* S, /*Some* G is not *any* S.

3. A Class which includes a Counter Class, not coinciding with it, includes a part (at least) of the Positive Class.

If *all* /S is *some* G, All S is *some* G.
If *all* /V is *some* (*only*) A, *Some* (*at least*) V is *some* A.

4. A Class of which a part only is included (or excluded) by a Counter Class, is partly included by the Positive Class.

If *some* G is *all* /S, *Some* G is *all* S.
If *some* (*only*) A is *all* /V, *Some* A is *some* V.

And so on. Besides the special Counter Class we might take account of the generic Counter Class; which again might be either general or limited by a higher Genus.

17. *Bidesignate Relationships detached from the Doctrine of Genus and Species.*

Not all the eight Bidesignate Relations have been accepted by all Logicians who have accepted the principle of Bidesignation. Sir W. Hamilton and Prof. Baynes accept all eight, but De Morgan, Mr. Spalding, and the Archbishop of York agree in rejecting E_2 and O_2. It is not, however, easy to see why E_2 and O_2 should be rejected, since our knowledge concerning the Relations of Classes may conceivably exist in those forms; and besides Toto-partial Exclusion, the form of E_2, is also the form of the Converse of O; and Parti-partial Exclusion, the form of O_2, is also the form of the Obverse of I. But a question arises with regard to A^2: for we know by Cor. 1, P. 1 and 2, § 6—that there cannot be two Classes which wholly coincide.

But 1. Artificial Classes may coincide in their constituents without coinciding in their explicit attribution; for their attribution may be a matter of convention; so that the same Terms may on account of some qualities constitute one Class, and on account of other qualities another Class.

2. A Natural Class possessing a peculiar proprium or attribute may be regarded as coinciding with any Artificial Class based upon that proprium or attribute: or an accident peculiar to the members of a Natural Class may also be the basis of a coincident Artificial Class.

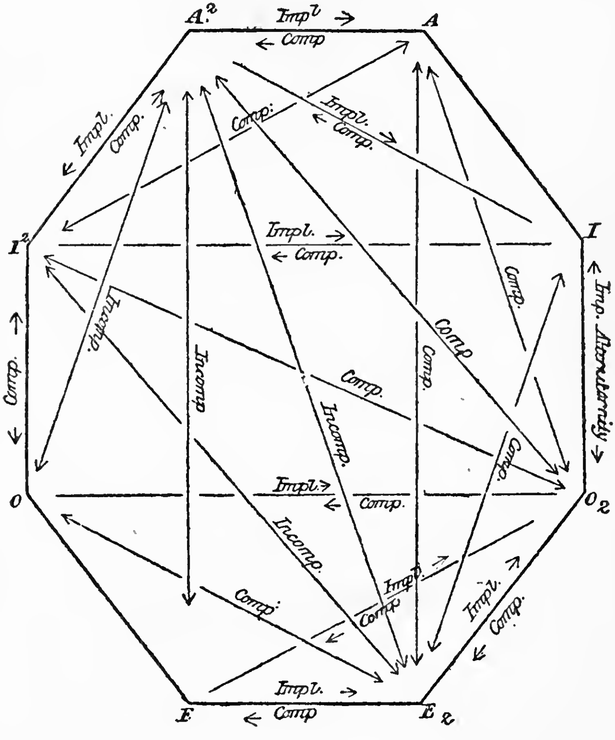
3. A Natural Class based on two attributes both of which are peculiar to the Class may be viewed as a coincidence of the Classes based on either attribute. Thus gravitating bodies and inert coincide in the Class material bodies; but this is really only one Class.

We conclude then to accept all eight Bidesignates, and proceed to consider their relations to one another. Instead of comparing them in detail, however, it may suffice to give the results of comparison in a diagram: in which the abbreviations may be interpreted—

Impl.	Implication,
Comp.	Compatibility,
Incomp.	Incompatibility,
Imp. Alter.	Imperfect Alteruternity.

1st. Octagon of Comparison.

(Relations given in the Square are omitted.)



2nd. Obverse Relationship.

1. If two Positive Classes coincide their Counter Classes coincide.

A^2 If *all* A is *all* V, *All* /A is *all* /V. (1) /A^2.

2. In so far as a Class is included (or excluded) by a Positive Class, or Part of a Positive Class, it is excluded (or included) by the Correlative Counter Class.

A^2. *All* A is *all* V
No A is *any* /V . . . (2) /A^2
A. *All* A is *some* V
No A is *any* /*some* V . . . /A
I^2. *Some* A is *all* V
Some A is not *any* /V . . . /I^2
I. *Some* A is *some* V
Some A is not *any* /*some* V . /I
E. *No* A is *any* V
All A is *some* /V . . . . /E
E_2. *No* A is *some* V
All A is *some* /*some* V . . . /E_2
O. *Some* A is not *any* V
Some A is *some* /V . . . . /O
O_2. *Some* A is not *some* V
Some A is *some* /*some* V . . /O_2

3. If two Counter Classes coincide, the correlative Positive Classes coincide: and so on.

It will be observed that E does not, like A^2, admit of double Obversion. We cannot say, that the Counter Classes of mutually exclusive Positives are mutually exclusive: this would be possible only if we knew the Positives to be equivalent to Class and Counter Class; as for instance, if they were two Species

which together coincided with a Genus: we might then, speaking with reference to the Genus, say—

No S is 2S ∴ No /S is /2S

But generally the Relations of the Counter Classes are too vague to render such an intuition possible.

Simple Conversion is applicable to all these Relations, and needs no illustration.

18. *Of the Addition and Subtraction of Attributes as affecting the Relations of Classes, &c.*

1*st. Abstraction and Generalization.*

Whether abstraction involves generalization, in other words, whether a decrease of Attribution is always accompanied by an increase of Constituency, is a well-worn, but, I suppose, unanswerable question. We can only say that potentially it is so, but whether actually may lie beyond our knowledge. There may, for instance, be a Class with attribution A B; and if there exist any Term marked with A and not with B, to subtract B from the attribution of the Class is certainly to increase its constituency: but we may not know of any such Term, and perhaps there really is none; though if we accept the inexhaustibility of Nature as a Logical assumption, such Terms must always be regarded as potentially existing.

As the subtraction of an attribute extends a Class

potentially, but perhaps not actually; so the addition of an attribute, potentially, but perhaps not actually, narrows it.

2nd. Class and Class.

What is the effect of a change in the attribution of any Class upon its Relations to other Classes?

1. Where two Classes are related as Genus and Species.

   a. Let the Genus increase in attribution.

   A Genus may increase in attribution by the discovery of a new essential quality prevailing throughout its constituency. Such an attribute must be common to Genus and Species, and cannot affect their Relationship.

   A Genus may increase in attribution at the expense of a Species by the discovery that a supposed specific difference really extends throughout the Genus; and should this extend to the whole difference, the Species would be submerged.

   b. Let the Genus decrease in attribution.

   A Genus may decrease in attribution by the discovery that a quality supposed essential is really only an inseparable accident of its constituents. A loss common to Genus and Species can only alter their Relationship by destroying the whole generic attribution.

   A Genus may also decrease in attribution by

the discovery that an attribute supposed generic is really the difference of one or more Species. This might destroy the Genus, or occasion the intermediation of a proximate Genus. And so on.

c. Let the Species increase, or decrease, in attribution.

The increase of a Species' difference by new attributes can only alter its Relation to a Genus by admitting the intermediation of a proximate Genus.

And similarly the decrease of specific difference, if not destructive, needs not affect the Relationship with the Genus.

2. Where two Classes are related by reciprocally Partial Inclusion; that is, where there are two Classes of Terms, and some Terms realize the attributions of both Classes.

   a. If it be discovered that all the Terms of one Class realize the attribution of the other, that Class is totally included in the other.

   b. The addition to both of attributes foreign to both, or the subtraction from both of attributes common to both, does not alter their Relationship.

3. Where two Classes are mutually exclusive.

   a. If the difference of one be added to the other, the one includes the other.

b. The addition to one, or both, of attributes foreign to both; or the subtraction from one, or both, of attributes foreign to both, leaves the exclusive Relationship unaltered.

Since the addition of a constituent to a Class (should it seem desirable) may occasion a decrease of attribution; the subtraction of a constituent, an increase of attribution; there is an opening here for a parallel series of propositions concerning the addition and subtraction of constituents.

3rd. Term and Class.

If any Term, or any number of Terms, be included in a Class, the addition to them of any quality or qualities not incompatible with (or destructive of) the attribution of the Class, does not exclude them from it: nor does the subtraction of qualities which do not confer the Class-attributes.

Thus, to take Archbishop Thompson's illustration, the addition of 'suffering' to a negro does not exclude him from the Class of fellow-creatures; since it is sufficiently notorious that suffering is compatible with the essential qualities of a fellow-creature: it is indeed a proprium of the Class.

But, as Prof. Bain remarks, we cannot argue—"Beauty is pleasure; hence, beauty in excess is pleasure in excess:" for excess is incompatible with

beauty, and must always exclude its subject from the Class of beautiful things; so that whether it be a pleasant thing we do not learn.

Or if we subtract from a negro his freedom, we do not exclude him from the Class of fellow-creatures; for hitherto freedom has been by no means an attribute of fellow-creatures: though perhaps it, too, becomes a proprium at a certain stage of development.

Similarly if any Term, or number of Terms, be excluded from a Class, the addition of qualities not conferring attributes on the Class, does not bring it within the Class.

CHAPTER VIII.

OF HYPOTHETICALS.

1. *Of Hypotheses in General.*

THE word Hypothesis signifies in general, something laid down to be tested or argued upon; but within this there are at least four shades of meaning which blend into one another. The most marked difference is perhaps between a Hypothesis viewed as an inference, and a Hypothesis viewed as a datum; but since an inference may become the datum for new inferences, the division even here is not quite distinct.

Hypotheses viewed as inferences are common property of the Theory of Reasoning and Logic regarded as a Science of Proof; for all inferences need proof; and that which we try to prove is nearly always an inference. To infer something is an act of reasoning; to test the inference belongs to Logic. In this sense an Hypothesis is—

1. A guess; or a kind of inference which Mr. Spencer * distinguishes from other kinds according

* Spencer: Psychology; Part VI. ch. viii.

to the "numerical ratio between the premised and inferred relations." If the inference be from a few known Relations to all that are similar in certain respects, it is Hypothetical; if from many to all, Inductive properly so called; if from all to some, Deductive; and so on. For the purposes of Logic we may call any inference offered for probation a Hypothesis.

2. An inference is especially called a Scientific Hypothesis, when it is elaborated and offered for verification as a Law of Nature. This is the condition of new Theories, while their truth is still very doubtful. In order to verify or disprove a Hypothesis we must compare it with the known facts and laws of Nature; and since we may not be able to do this directly, the Hypothesis should be such that we are able to make further inferences or deductions from it: * and thus it becomes a datum.

Regarded as data, Hypotheses may be designed to be true, or approximations to the truth; or they may be designedly false, and only used as a means of proving something else.

3. Thus a new theory put forward for verification is intended by its inventor to be true. And the abstractions of Geometry and other sciences, such as the definition of a line or a point, if considered to be Hypotheses, may be ranged under this head. But

* Jevons: Principles of Science; ch. xxiii.

Prof. Bain * hesitates to call these abstractions Hypotheses; and they differ from other Hypotheses in not being at all doubtful; for in reality they are certainly false, and in ideality certainly true. However they agree with Hypotheses in this that they are something laid down to be argued upon.

4. A false Hypothesis may be assumed as a means to the indirect proof of a true one, when direct proof is not attainable. Thus if we cannot directly prove a line to be equal to another, we may assume it to be either greater or less, and by disproving both of these false Hypotheses, show the necessity of the true one. It is in the interpretation of false Hypotheses that rules of procedure are especially needed, since there may be nothing else to guide us, and we often have to conduct an argument repugnant at every step to our plainest intuitions.

2. *Hypothetical Relationship.*

A Hypothetical Relationship is interpreted as if it were the truth and the whole truth; as if the explicit data were exact and exhaustive. Here the Rules of Husbandry and Continence are particularly to be borne in mind: it is required to find how to deduce from the Hypothesis all that it contains, and to assume nothing that it does not contain.

* Logic: Book III. ch. xiii. § 6.

And Hypothetical Relationships, corresponding, or professing to correspond, with matter of fact, must admit of the same analysis. They have accordingly been reduced to two forms—in one or other of which any matter-of-fact may likewise be expressed—namely, the Conditional and the Disjunctive; for everything is conditioned, and to everything there is an alternative.

3. *Of Conditionals.*

The word Condition is most strongly associated with Causation, but may be applied to any Term which is a mark of another; and a Term may be the mark of another by constant Relationship either of Causation or of Coexistence. Including Causal Relation and Coexistence under the single name Concomitance, we may define the Condition of a Term to be any constant Concomitant.

Constant Concomitance is either Perfect or Imperfect. Two Terms are perfectly concomitant if they occur together, and neither ever occurs without the other: imperfectly concomitant, if one never occurs without the other, but the other sometimes occurs without the first.

Perfect Concomitance is represented by the Relation of Cause and Effect where there is no vicarious Cause. Thus in deducing the Experimental Methods, we were able to write (on the supposition that there were no vicarious Causes) :—

1. If E is present C is present.
2. If C is absent E is absent.
3. If C is present E is present.
4. If E is absent C is absent.

Similarly if two Terms are perfectly concomitant by Coexistence, as appears to be the case with Gravity and Inertia, we may write—

1. If G is present I is present.
2. If I „ G „
3. If G is absent I is absent.
4. If I „ G „

And this thorough going Concomitance is similar to the coincidence of Classes symbolised by A^2; or rather it is that coincidence, since the coincidence of Classes depends upon the coextension of qualities. Thus we write—

All gravitating bodies are *all* inert.

Imperfect Concomitance on the other hand is represented by the Relation of Cause and Effect, if there are vicarious Causes. For then we may write—

1. If C is present, E is present.
2. If E is absent, C is absent.

But we cannot write with certainty—

3. If E is present, C is present.
4. If C is absent, E is absent.

For in either of these cases E may be present in concomitance with the vicarious Cause.

And again if two Terms be imperfectly concomitant by Coexistence, as appears to be the case with Inertia and Extension, we may write—

1. If I is present, E is present.
2. If E is absent, I is absent.

But we cannot write—

3. If E is present, I is present.
4. If I is absent, E is absent.

For Space is regarded as Extension without Inertia, that being its difference from Matter. And this imperfect Concomitance is similar to the Relationship of Classes symbolised by A :* if the constituency of one Class include the members of a second and other Terms besides; it is because the attribution of the former Class always accompanies the attribution of the latter, and is sometimes found without it. Thus we may write—

All inert entities are (*some*) extended.

4. *Of Disjunctives.*

Hypothetic Alteruternity is called Disjunction. A Disjunction, then, may be Perfect or Imperfect, according as the Alteruternity is perfect or imperfect; that is, according as the Terms are or are not mutually exclusive.

* Bain: Book I. ch. iii. § 31 (Logic).

A perfect Disjunction is given in every case by Class and Counter Class, and so in every clear Division by Dichotomy. If we knew of any Genus that it contained only two Species, and that these were mutually exclusive, we should know that any member of the Genus was included in one or the other, and that no member was included in both.

Any member of G is either S or CS (Counter Species). We may then write—

1. If G is S, it is not CS.
2. If G ,, CS, ,, S.
3. If G is not S, it is CS.
4. If G ,, CS, ,, S.

This, it will be observed, is equivalent to simple Obversion; and if, instead of two alternatives, we have three or more, it makes no real difference.

Any G is either S, or 2S, or R (Remainder).

1. If G is either S or 2S, it is not R;
   G is either S or 2S:
   If G is S, it is not 2S:

and so on, by a sort of inverse Dichotomy.

Similarly we may have a Hypothesis concerning Cause and Effect:

The Effect of C is either E or F, and not both: and this too has four forms.

An imperfect Disjunction, on the other hand, is

given in every Division that does not run clear. Such a Disjunction has only two forms. If the Hypothesis be that animals live either on land or in the water, we may write—

	1. If A is not L, it is W
	2. If A „ W, „ L:
but not—	3. If A is L, it is not W
	4. If A „ W, „ L;

for some animals are amphibious.

I may add an Obverse equivalent of a sound Disjunction whether perfect or imperfect:

Any G is either S or 2S
∴ No G is /(S and 2S).

If this Obverse is not true, on account of a Remainder, the original Disjunction is inadequate.

5. *Probation of Hypotheticals.*

These hypothetical forms may convey either known truths (or untruths) or Hypotheses properly so-called, that is, cases for probation. In either contingency they have to be interpreted. And if a known fact is stated in hypothetic form—if in saying

If A is, B is,

we mean the only doubtful point to be the existence of A at any time; the interpretation of the Relation

is all that concerns us. But if there be any doubt as to the constancy of the Relation A : B, we interpret the Relation chiefly for the sake of discovering the possible modes of testing it.

If now a Conditional be given in which the only doubtful element is the occurrence of the conditions; then, if we know the Concomitance of the Terms to be perfect, no antiquity of Logical custom to the contrary, ought to prevent us from availing ourselves of that knowledge, and interpreting the Relationship, as above, in all four ways; for this is according to the Rule of Husbandry. But if we know the Concomitance to be imperfect, or only do not know it to be perfect; then, according to the Rule of Continence, we must only regard it as having two forms. Similarly if we know a Disjunction to be perfect, the four forms may be accepted; but if we know it to be imperfect, or do not know it to be perfect, we can only accept two.

On the other hand, I conceive, if we are interpreting a Hypothetical of any kind for the sake of probation, the Rule of Husbandry directs that, whether given as perfect, or not, we should interpret and try it in all four aspects; for the Hypothesis may be better than its promise. Thus a Hypothetical Relation of any kind, supposed perfect, may prove imperfect; or, supposed imperfect, may prove perfect; or, supposed true, may prove false; or, supposed false, may prove true.

And with regard to Disjunctives in particular, a kind of falsehood to be carefully guarded against is inadequacy; where a Division is not exhaustive; as when two Species are given as together coinciding with a Genus, though in fact there is a Remainder. After interpretation, the actual probation of Hypotheticals is of course conducted according to the means appropriate in each case, whether the Relation involved be of Succession or Coexistence.

All Hypotheses may, I think, be reduced to one or other of the forms here discussed; and we have seen Disjunctives readily take the form of Conditionals, without however changing their real nature. For a Conditional is essentially a Hypothesis concerning Concomitance or Nonconcomitance as simple Relations; a Disjunctive, a Hypothesis concerning Concomitance or Nonconcomitance as alternative Relations: of which facts, as of interlacing fibres, the whole tree of Logic is compacted,—of one substance in root and leaf.

The Dilemma, compounded of a Conditional and a Disjunctive, involves no principle peculiar to itself, and needs not be discussed here; though requiring like all hypothetical forms careful treatment in a work on Rhetoric.

CHAPTER IX.

OF THE MEDIATE RELATIONSHIP OF CLASSES.

1. *The Question stated.*

ALTHOUGH every known Relation of Classes with respect to Inclusion and Exclusion may be regarded as Immediate; it may happen that the Relation of certain Classes to one another is to be most readily discovered not by direct comparison of these Classes among themselves, but by the interference of some other Class to which their Relations are already known. These are cases in which, the Relations of two or more Classes to a third being known, we have proof of their Relations to one another; and Classes thus mediately compared may be regarded as mediately related.

Any number of Classes may stand to one another in Mediate Relationship; a Relation between two Classes may be proved to obtain by the intervention of one other Class or of many; but it is usual to discuss the subject chiefly with regard to the Relationship of three Classes; this is, the doctrine of the Syllogism, or, as we may call it, Mediate Subsump-

tion. The Relations of two Classes to a third being given, it is required to find their Relations to one another; or if there are cases where the Relations of two Classes to a third do not show the Relation of those two Classes to one another, we have to determine what those cases are. This problem of the three Classes is the only problem as to the Mediate Relationship of Classes which it is necessary to treat of at length: since the consideration of more than three Classes presents no novelty of principle.

2. *Definitions.*

Of the three Classes—

1. That to which the Relations of the other two are already known is called the Middle Class.
2. Those between which a Relation is to be discovered by the intervention of the Middle, may be called the Outer Classes.

3. *Possible Modes of combining the Unidesignate Relations of Two Classes to a Third.**

There are six different modes of Unidesignate Relationship between the Middle and one Outer Class.

* Cf. De Morgan: First Notions of Logic.

1. *All* A is M.
2. *Some* A is M.
3. *No* A is M.
4. *Some* A is not M.
5. *All* M is A.
6. *Some* M is not A.

Two other Relations verbally different—

Some M is A

No M is A—

are the same as the second and third cases. And similarly to the other Outer the Middle may be related also in six ways. And since in comparing together the Outers by means of the Middle, any mode in which the Middle can be related to one Outer, may be combined with any mode in which it can be related to the other; there are in all thirty-six possible ways in which the Relations of a Middle to two Outers may be formulated. But of these thirty-six modes, fifteen are merely superfluous repetitions of some of the others; so that there are only twenty-one really different ways of stating the Relations of two Classes to a third.

It will be found that only ten of the twenty-one combinations prove direct Relations to subsist between the Outer Classes. Eleven combinations remain: of which three yield evidence of indirect Relations between the Outers, that is, of Relations between their Counter Classes; and eight are altogether inconclusive.

We have to examine the nature both of those combinations which are forms of Proof, and of those which prove nothing.

4. *Conditions of Mediation.*

The Relations of Classes whether Mediate or Immediate may be viewed either as to attribution or as to constituency; and it does not matter in which way, since we have seen that one aspect of a Relation is a constant mark of the other. If we view the Relation of two Classes as a Relation of their constituencies, to say that one includes the other is to say that their constituents are (part or all of them) the same Terms; to say that one excludes the other, is to say that their constituents are (part or all of them) not the same Terms. And to prove such Relations not by a direct examination of the Terms, but by comparison with a third Class, is only possible if the known Relations of the two Classes to the third are such as to show, 1, where the Relation to be established is Inclusive, that certain Terms of the Middle are Terms of both the Outer Classes; or, 2, where the Relation to be established is Exclusive, that certain constituents of the Middle are constituents of one of the Outer Classes, and not of the other. Thus in every case in which an Inclusive Relationship is mediately proved, one of the Outer Classes is given as totally including the Middle, and

the other Outer as also wholly or partially including it, or included in it; that is, all the constituents of the Middle are constituents of one Outer, and some at least are constituents of the other. And so on.

5. *Axioms of Mediate Subsumption.*

Are there any Axioms that generalize the conditions of Mediate Subsumption; and, if so, what are they? This question as to the presiding Axiom of the Syllogism, has lately been much debated. It had been the usual practice of Logicians to affirm that the Axiom of all Syllogistic reasoning was the famous *Dictum*: some, however, of whom Kant * was the greatest name, held that the true Axiom was the *Nota notae*. According to Hamilton,† the *Dictum* was the peculiar canon of Extensive Syllogisms (Mediate Relation of Classes viewed in their constituencies); the *Nota notae* was the peculiar canon of Intensive Syllogisms (Mediate Relation of Classes viewed in their attributions). Mill rejected altogether the *Dictum*, on the ground that it begged the question; and proposed instead Axioms closely resembling the *Nota notae*, namely:

1. "Things which coexist with the same thing coexist with one another: or (still more precisely)"—as he observes in his latest Editions

* Logik: Allg. Elementarlehre, § 93.

† Logic: Lecture XVI.

—"a thing which coexists with another thing, which other coexists with a third thing, also coexists with that third thing.

2. "A thing which coexists with another thing, with which other thing a third thing does not coexist, is not coexistent with that third thing."*

Similar Axioms to these we have already recognized as formulating certain modes of Triterminal Correlation; we noticed, too, the limitations with which they were to be understood; and we observed that the Relations of Classes were not governed by these laws.† Prof. Bain, again, departing from Mill at this point, apparently prefers to fall back upon the *Dictum*, only amending it so as to fence it against the imputation of begging the question.

His amended statement of it reads:

"Whatever is true of a whole class (class indefinate, fixed by connotation), is true of whatever thing can be affirmed to come under, or belong to, the class (as ascertained by connotation)."‡

As long as we regard the Syllogism as a Relationship of three Classes, the chief objection, from the point of view of this Essay, to the *Dictum* as worded by Prof. Bain, is that it contains allusions to the theory of Names and Predication, which we regard

* System of Logic: Book II. ch. ii. § 3.

† *Ante*, ch. iv. part ii., § 4.

‡ Bain: Logic; Book II. ch. i. § 11.

as belonging to Rhetoric. We are thus again driven to find new statements for old principles; and accordingly propose the following Axioms, under which all conclusive cases of the Mediate Relationship of Classes regarded as matter-of-fact may readily be brought.

And first, with regard to Classes viewed as to their constituencies—

Axioms of Constituent Mediate Relationship.

1. Inclusion: A Class that includes a second Class, that includes a third, itself includes the third in so far as the third is included in the second.*
2. Exclusion: A Class (or Part-Class) that excludes a Class, that includes a third Class, itself excludes the third Class, in so far as the third is included in the second.

A moment's consideration will show the resemblance between these Axioms and the *Dictum* in its old form. We may write the *Dictum* thus:

Whatever is affirmed (or denied) of a Class, is affirmed (or denied) of every part of it.

But that which is affirmed of a Class is always an attribute; and every attribute is the basis of a Class. To say 'whatever is affirmed of a Class,' then, amounts to saying 'whatever Class includes another Class;' and the whole *Dictum* amounts to this: A Class that includes a Class, includes every part of it. And

* Cf. Leibnitz: Definitiones Logicae; § 12, &c.

either this 'part' is specified (marked with specific attributes), and therefore itself a third Class, or representative of a third Class; or else, if it is not specified there is no third Class, and no real mediation.

But, again, as every attribute is the basis of a Class, so every Class is based upon attributes; a Term or Class can be included in two or more different Classes only by realizing their respective attributions; and if it is excluded from any Class, it is for not possessing the requisite qualities.

The Inclusion and Exclusion of Classes is, as we often remarked, equivalent to the Concomitance and Nonconcomitance of qualities. We may therefore rewrite the above Axioms in forms better agreeing with Prof. Bain's amended statement of the *Dictum*.

Axiom of Attributional Mediate Relationship.

1. Inclusion: A Class whose attribution is included in the attribution of a second Class, whose attribution is realized in the constituents of a third Class, or in some of them,—includes those constituents of the third Class.
2. Exclusion: If the constituents of a Class (or some of them) do not realize the attribution of a second Class, whose attribution is realized by the constituents of a third Class (or by some of them); the constituents of the first and third Classes (or some of them) are not identical.

6. *Cautions as to Mediate Subsumption.*

In their quantitative form it was remarked, the Axioms given above resemble the *Dictum;* and we may deduce from them Cautions of valid Mediation similar to those usually deduced from the *Dictum* : or the Cautions may be viewed as flowing, like the Axioms, from the nature of the Middle as a mediating Class.

1. If we are comparing two Classes with a third, we must preserve the identity of the three Classes severally throughout the comparison, or there is no real comparison at all.
2. The Middle must be given as totally related to at least one of the Outer Classes (or to part of one). For else with the vague designation of Logical Relationships, we have no assurance that we are comparing the Outers with the same part of the Middle.
3. No Class not totally related in the premises can be shown to be totally related in the conclusion. For the Middle cannot transfer to one Outer more of the other than itself contains.
4. Where both premises are Exclusive Relations, no direct Relation between the Outers can be proved : for there is no direct mediation.

   But there may be evidence of some Relation between the Counter Classes.
5. If one premise be an Exclusive Relation the

conclusion must be an Exclusive Relation: for we cannot know that the Middle contains any part of one Outer to transfer to the other.

Corollaries: 1. Two premises of Partial Relation prove no (Unidesignate) Relation.

2. If one premise be a Partial Relation the conclusion must be Partial.

7. *Ten Modes in which the Relations of Two Classes to a Third may prove something as to their Direct Relation to one another.*

a. Eight with Unidesignate Conclusions; namely,

(a). Three Inclusive.

1. Where the Middle totally includes one Outer, and is totally included in the other.

All A is M; *All* M is V:
∴ *All* A is V.

2. Where the Middle is totally included in both the Outer Classes.

All M is A; *All* M is V:
∴ *Some* A is V.

3. Where the Middle is totally included in one Outer, and partially in the other.

All M is A; *Some* M is V:
∴ *Some* A is V.

(b). Five Exclusive.

4. Where the Middle totally excludes one Outer, and totally includes the other.

No A is M; *All* V is M:
∴ *No* A is V.

5. Where the Middle totally excludes one Outer, and is totally included in the other.

No A is M; *All* M is V:
∴ *Some* V is not A.

6. Where the Middle totally excludes one Outer, and partially includes the other.

No A is M; *Some* V is M:
∴ *Some* V is not A.

7. Where the Middle totally includes one Outer, and partially excludes the other.

All A is M; *Some* V is not M:
∴ *Some* V is not A.

8. Where the Middle is totally included in one Outer, and partially excluded by the other.

All M is A; *Some* M is not V:
∴ *Some* A is not V.

β. Two with Bidesignate Conclusions.

9. Where the Middle is totally included in one Outer, and partially excludes the other.

All M is A; *Some* V is not M:
∴ *Some* V is not *some* A.

10. Where the Middle partially includes one Outer, and partially excludes the other.

> *Some* A is M; *Some* V is not M:
> ∴ *Some* A is not *some* V.

8. *Reduction of Irregular Cases.*

Four of these ten cases, or Moods, come readily enough under the Axioms: namely, No. 1 and No. 3 manifestly realize the Axiom of Inclusion; and No. 4 and No. 6, the Axiom of Exclusion. These may be called Regular, the others Irregular. The agreement of the Irregular cases with the Axioms may be shown in two ways.

First, we may deduce from the Axioms secondary principles for immediate application to the Irregular cases. For instance, from the Axiom of Inclusion we may deduce the principle:

> Classes including the same Class include part of one another:

and this applies directly to No. 2. And so from the Axiom of Exclusion we may deduce the principle:

> A Class that excludes a Class included in a third, partially at least excludes the third:

and this applies directly to No. 5. And similarly the other cases may be treated.

Or, secondly, we may adopt the inverse process, and reduce the Irregular cases to forms, in which they better suit the Axioms; as in the Scholastic

Logic the Moods of all other Figures are reduced to the Moods of the First. I need not reduce No. 2 and No. 5, but will merely treat the remainder.

No. 7 may be written

Some V is not M = *No* M is *some* V;
All A is M:

that is, a part of a Class (Some V) excludes a Class (M), which includes a third class (A); therefore, according to the Axiom of Exclusion,

Some V is not A.

No. 8 will be recognized as Baroko, and may be reduced in two ways, besides the old *reductio ad impossibile*, which was not, properly speaking, a reduction at all. We may reduce it under the Axiom of Exclusion by regarding *Some M* as a whole Class, thus: V excludes *Some M;* and that *Some M* (*all M*) includes *Some A;* &c. Or we may bring it under the Axiom of Inclusion by obverting one premise:

All M is A;
Some M is not V = *Some* M is /V:
∴ *Some* A is /V = *Some* A is not V.

No. 9 is reducible to No. 10 by converting one premise:

All M is A = *Some* A is M.

No. 10 is reducible by converting one premise:

Some V is not M = *No* M is *some* V;
Some A is M:

that is, a Part-Class (*Some V*) excludes a class (*M*), that includes part of another class (*Some A*); therefore, according to the Axiom of Exclusion,

Some V is not *some* A = *Some* A is not *some* V.

These Bidesignate conclusions from Unidesignate premises, have not been usually recognized; and the information they afford is, to be sure, very meagre: but I remember the Rule of Husbandry, and am unwilling to let the smallest grain of knowledge slip through a crack in the threshing floor. The Relation *Some A is not some V* (O_2) is compatible even with A^2; since if A^2 obtain, O_2 will mean *Some A is not some A*, or *Some V is not some V*. Still we may learn this from it: either A and V do not wholly coincide; or, if they do, the Class (A or V) is divisible. If A and V be one Class, we know that some of it is M, and some is not: and this must result from some observable difference in the qualities of its members, and may be a hint toward developing a classification.

The reason why two partial Relations, one of which is exclusive, may yield a conclusion; but not if both be inclusive; is that in the former case the Middle may be given as totally related (Caution 2): *Some* V is not M = *No* M is *some* V. Even so, however, a conclusion is only obtained by treating Part-Classes as wholes.

9. *Three modes in which the Relations of Two Classes to a Third prove something as to the Relations of their Counter Classes.*

1. Where the Middle wholly excludes both Outer Classes.

No A is M; *No* V is M:
∴ *Some* /A is /V.

2. Where the Middle is totally excluded from one Outer and partially from the other.

No M is A; *Some* M is not V:
∴ *Some* /V is /A.

3. Where the Middle wholly includes both the Outer Classes.

All A is M; *All* V is M:
∴ *Some* /A is /V.

10. *Reduction of Obverse Cases.*

The Axioms of the Mediate Subsumption of Classes apply equally to the Mediate Subsumption of Counter Classes, or of mixed Classes and Counter Classes.

No. 1 is reducible to No. 2 Direct:

No A is M = *All* M is /A;
No V is M = *All* M is /V:
∴ *Some* /A is /V.

No. 2 is reducible to No. 3 Direct:

No M is A = *All* M is /A;
Some M is not V = *Some* M is /V:
∴ *Some* /V is /A.

Here the least quantity of Counter Class common to A and V must be, in No. 1, *All* M, in No. 2, *Some* M. In the third case the common Counter Class must be at least /M.

No. 3 is reducible to No. 5 Direct:

All A is M = *No* A is /M;
All V is M = *All* /M is /V.
∴ *Some* /V is not A = *Some* /V is /A.

It will be observed that by making free use of Obversion, the Axiom of Exclusion may be reduced to that of Inclusion, or the Axiom of Inclusion to that of Exclusion. But this would be no real simplification; and would in fact increase the trouble of reduction, by rendering necessary more complicated manœuvres with the machinery of equivalence.

11. *Eight Cases in which the Relations of Two Classes to a Third prove nothing as to their Relations to one another.*

1. Where the Middle includes one Outer totally and the other partially.

   All A is M; *Some* V is M.

2. Where the Middle includes both Outers partially.

   Some A is M; *Some* V is M.

3. Where the Middle totally includes one Outer Class, and is partially excluded by the other.

   All A is M; *Some* M is not V.

4. Where the Middle partially includes one Outer, and is partially excluded by the other.

Some A is M ; *Some* M is not V.

5. Where the Middle excludes one Outer totally, and the other partially.

No A is M ; *Some* V is not M.

6. Where the Middle partially excludes both Outers.

Some A is not M ; *Some* V is not M.

7. Where the Middle partially excludes one Outer, and is partially excluded by the other.

Some A is not M ; *Some* M is not V.

8. Where the Middle is partially excluded from both Outers.

Some M is not A ; *Some* M is not V.

These eight cases yielding no conclusion are distinguished from the others by this, that the premises admit of all possible modes of Relationship obtaining between the Outer Classes. A may totally include V; or V, A; or they may totally exclude one another: and their Counter Classes too may be similarly related in every possible way. But this is not true of those combinations of premises that give conclusions: in them some particular Relation must obtain between the Outers (or parts of them regarded as wholes), or between their Counter Classes; excluding of course in each case the incompatible Relation.

12. *Mediation of Bidesignates.*

The possible combinations among the Bidesignate Relations of two Classes to a third are sixty-four. Subtracting twenty-eight, which are repetitions of others, there remain thirty-six. These I have cursorily examined with a view to sorting them, but need not give the results at length. There appear to be twenty combinations that yield direct conclusions: seven Inclusive, and thirteen Exclusive. Three give indirect conclusions as to the Relations of the Counter Classes; and thirteen prove nothing at all.

In this computation Bidesignates are regarded as detached from the restrictions of Genus and Species, so that in their designation *Some* means *Some at least.*

We might further consider the possible combinations of Unidesignate with Bidesignate premises.

13. *Mood and Figure.*

The Moods and Figures of Scholastic Logic may, if it appear desirable, be replaced in this system by some such classification as the following:

Figures, in which the Premises are
- Unidesignate . Moods, in which the Conclusions are
  - Regular .
    - Inclusive 2.
    - Exclusive 3.
  - Irregular .
    - Direct .
      - Inclusive 1.
      - Exclusive
        - Unidesignate 3.
        - Bidesignate 2.
    - Indirect 3.
- Bidesignate &c.

14. *Mediation of Hypotheticals.*

Cases of Mediate Subsumption may occur in which one or more of the Classes compared is affected by an Hypothesis.

If A is B, C is M ; *All* M is V :
∴ If A is B, C is V.
A is M, if M is N ; *All* M is V :
∴ If M is N, A is V.

And so on. Such cases come at once under the Axioms, but for the hypothetic element; and this should, I conceive, be regarded as something quite

extraneous; since it reappears in the conclusion in the same form as in the premises, having been altogether unaltered in the process.

Similarly we may have cases involving Disjunctives.

Either A, or B, or C, is M; *All* M is V:
∴ Either A, or B, or C, is V.
No A is either M or N; *All* V is either M or N:
∴ *No* A is V.

In the former of these cases the hypothesis is extraneous: in the latter it is a means of mediation. And to bring this second case under the Axiom, we must regard the Disjunctives, *either M or N*, as together forming a whole; just as we previously regarded a Part-Class as forming a whole, when drawing a bidesignate conclusion from unidesignate premises. Suppose, for instance, that S and 2S are the only Species of a given Genus, without Remainder:

No A is either S or 2S = *No* A is G.
No A is either M or N = *No* A is (M and N).

15. *Sorites.*

An unknown Relation between two Classes may also be discovered and proved by the intervention of more than one Middle.

All A is M; *All* M is 2M; *All* 2M is V ∴ *All* A is V.

Such cases are called Sorites. In the above instance there are two Middles; and a new Middle would be added with every further step.

How many steps a Sorites extends does not matter as long as the sanction of the Axioms of Mediate Relation is retained. We might indeed frame special Axioms of Sorites, such as these:

1. A Term or Class subsumed under a second Class, is subsumed under as many Classes as the second Class is subsumed under.
2. A term or Class subsumed under a second Class, is not subsumed under any Class which is excluded either by the second Class or by any Class under which the second Class is subsumed.

There would be corresponding Axioms of the Progressive Sorites. And these Axioms might sometimes be useful: but for safety it is better to break up a Sorites to which any suspicion attaches into links of three Classes, to which the Axioms of the Syllogism may be directly applied.

Thus to set aside all doubt whether in the above instance A is V, we may proceed in this way:

All A is M; *All* M is 2M ∴ *All* A is 2M.
All A is 2M; *All* 2M is V ∴ *All* A is V.

A Sorites, in fact, contains as many cases of Mediate Relation as Middle Classes. Accordingly it is subject throughout to the Rules and Cautions of valid Mediation. If it contains more than one ex-

clusive or partial Relation, however far apart they may be, the evidence is vitiated as if there were only three Classes to be considered.

All A is B; No B is C; All C is D; No D is E.

Breaking up this chain we get—

All A is B; No B is C ∴ No A is C
No A is C; All C is D ∴ Some D is not A
Some D is not A; No D is E ∴ Some /A is /E.

And similarly with other occasions of error; the chain may only attenuate, or may quite break in pieces: we must look to the unity and total Relation of each Middle; and so on.

N.B.

16. *How many Terms has a Syllogism?*

Perhaps in the seventh Chapter and the present one I have sometimes seemed to be forgetting whilst dealing with Classes the speculations of the earlier parts of the book: but I hope that the unity of the whole inquiry will become apparent in the course of the investigation upon which I now enter. It has always been regarded as an unquestionable maxim of Logic that a Syllogism must have three Terms. Both the *Dictum* and Mill's Axioms assume this: the Terms intended in the former case being Classes; and in the latter case, Attributes. And it lies on the face of the Axioms of the Mediate Relationship of

Classes brought forward in § 5 of this Chapter, that, if by a Term be meant an explicit Class, a Syllogism is supposed to have three Terms. In the fourth Chapter, however, I seemed to adopt certain views of Mr. Spencer's which are set by him in opposition both to the Scholastic account of the Syllogism and to Mill's doctrine; and of which perhaps the most startling is, that a Syllogism has four Terms:—so that I may now appear to be landed in a contradiction.

But the truth is that Classes are seldom Terms of the same kind as those of which we treated in the fourth Chapter.* In dealing with Classes as we have lately been doing, we resort to an artifice, an abbreviated mode of expression, which we are liable to pay for by sublation of thought. If throwing away the clogs of language we get our own feet upon the facts, and explore once more the actual Correlations of phenomena, we shall probably perceive that a Syllogism comprises more than three Terms, and even more than four.

To take an example: how many Terms has this Syllogism?

Men are mortal;
Greeks are men:
Greeks are mortal.

According to the old view, there are three Terms,

Greeks, Men, Mortals,

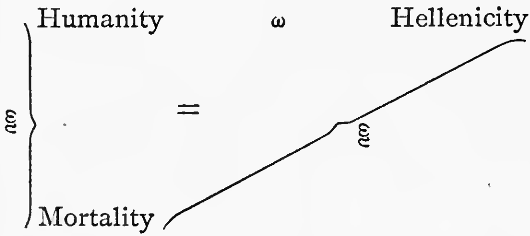
* Cf. ch. vi. § 32.

or in comprehension,

Mortality, Humanity, Hellenicity:

and either way the three Terms slide one into the other, as one shuts up a telescope.

According to Mill's Axiom, the Correlation might be symbolized thus:



This, however, does not represent a Relationship of Classes at all; but only the Concomitance of certain three qualities in the members of one Class, namely Greeks. For Hellenicity is not concomitant with all Humanity, nor Humanity with all Mortality. The evidence thus adduced for the mortality of Greeks is, the mortality of Greeks and no more: but much more is intended when it is argued that Greeks are mortal, because all men are. To rely on Mill's Axiom is to lose all that evidence of the mortality of Greeks which is derived from the mortality of the rest of mankind.

So far then I agree with Mr. Spencer that Mill's view is insufficient: but I cannot assent to the view which he appears to take, that the symbol of Quad-

riterminal Correlation adequately represents the Correlation formulated in a Syllogism.

$$\left.\begin{array}{r}\text{Mankind}\\ \\ \omega\\ \\ \text{Mortality}\end{array}\right\} = \left\{\begin{array}{l}\text{Certain men unspecified.}\\ \\ \omega\\ \\ \text{Mortality.}\end{array}\right.$$

This, it seems to me, is all than can fairly be got into a Symbol of Quadriterminal Correlation, and this represents a Relation of qualities in the members of only two Classes (Humanity and Mortality), not of three — a single Subsumption, not a double and Mediate Subsumption. The differential nature of Greeks is here omitted; wherein perhaps there may lurk something incompatible with Mortality. The Correlation formulated in a Syllogism, therefore, must be represented as Quinqueterminal—

First Subsumption

$$\longleftarrow$$

$$\left.\begin{array}{r}\text{Humanity}\\ \text{in general}\\ \\ \omega\\ \\ \text{Mortality}\end{array}\right\} \downarrow \;=\; \text{Second Subsumption} \left\{\begin{array}{lcl}\text{Humanity} & \omega & \text{Hellenicity}\\ & & \\ \omega & & \omega \\ & & \\ \text{Mortality} & & \end{array}\right.$$

And Quinqueterminal Correlation, it will be noticed, is a union of Quadriterminal and Triterminal Correlations.

The above Syllogism then really comprises five Terms:

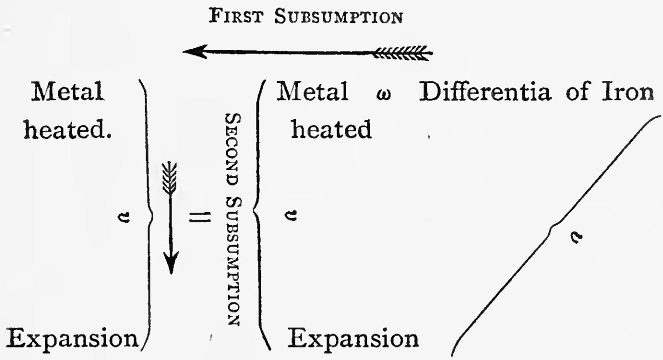
1. Hellenicity.
2. Hellenic Humanity.
3. Mortality of Hellenic Humanity.
4. Non-Hellenic Humanity.
5. Mortality of Non-Hellenic Humanity.

Thus we see that in the Axioms of the Syllogism as above stated the three Classes spoken of are, two of them (Humanity and Mortality) divisible each into two portions (Hellenic and Non-Hellenic); and one of the two (Mortality) contains a third portion, namely, Non-human Mortality, which is not a Term of the Syllogism. And it may contribute to the right understanding of Logic, as well as to the uniformity of its formulæ (which is a test of truth), if we write the Axiom of the Syllogism thus:

Rule of Quinqueterminal Correlation.

A Term that coexists with a second Term,—that second Term and a third being severally the same as a fourth and a fifth Term, which are related to one another by Co-existence or Succession,—is related to the third Term, as the fourth to the fifth, and as the second to the third.

For that the Rule and its equivalent Axioms apply to Classes of Causal Instances as well as to Kinds will be apparent to anyone who contemplates this symbol:



and observes that this is as much as to say, Expanded bodies include heated metals, which include heated iron.

17. *Table of the Modes of Implication.*

We see, then, that there are four principal kinds of the Implication of Relations—four modes of Correlation in which Relations that are explicit, imply and prove Relations that are not explicit.

Let us exhibit this in a Table:

Implication	Immediate	Biterminal Correlations (Doubly Conjunct).	The Relations compared may be severally constant or inconstant.
	Mediate	Triterminal Correlations (Singly Conjunct).	
		Quadriterminal Correlations (Disjunct).	The Relations compared are severally constant.
		Quinqueterminal Correlations (Disjunct and Conjunct).	

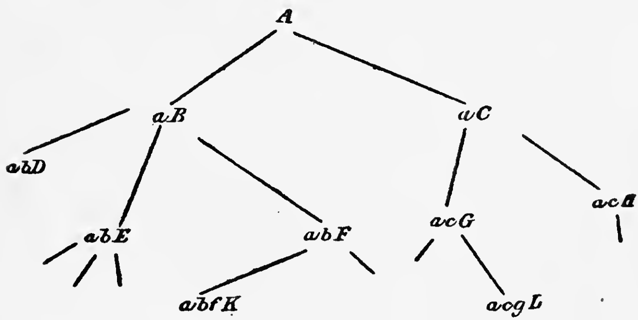
The first three modes appear to be elementary and irreducible: The fourth mode is compounded of the second and third; but cannot, I think be reduced to them without loss; all other compound modes as far as I have examined them, are easily reducible and do not need separate discussion.

18. *Classification.*

In discussing questions of Mediate Relationship we have now compared Relations of all kinds except those of Genus and Species. The extension of the doctrine of Genus and Species to the subordinate

Relations of more than two Classes, leads to the consideration of grades of Classification higher than the lowest Genus, in which the lowest Genus may be itself contained. It has been impossible to keep such considerations hitherto entirely out of sight; but this seems to be the best place to bring them explicitly forward.

Between a Summum Genus and an Infima Species there may exist a gradation of Classes of unknown extent. So many attributes as a Class has, so many grades of Classification may stand above it: each attribute being in turn the difference of a grade. From the most to the least general grade, at each step downward in the scale, the attributions of Classes increase while their constituencies diminish; and the subdivision may be continued as long as any



discernible difference remains. The Classifications investigated in Botany, &c., aim at exhibiting this order as it exists in Nature: and certain expressions

have been appropriated to denote the successive stages of decreasing generality, as, for instance—Kingdom, Order, Family, Tribe: reserving the words Genus and Species for the last two steps in the descent.

The above diagram represents an irregular Classification in four grades. The capital letters stand for Classes, and each for the difference of its Class; the small letters are for the other attributes. A might be called an Order; B and C Tribes; D, E, F, G, H, Genera; K, L, &c., Species. But for the purposes of Logic it is usual to speak of Genus and Species only; to make these names moveable up and down the scale, and relative only to one another. As we cannot know beforehand how many grades of Classification may exist in Nature, nor can we devise beforehand a suitable terminology, this is a matter for special Science. In Logic, which with regard to special matter is a Science *à priori*, it is usual to say, with reference to the diagram, for instance, that K and L are Species and as far as appears Species only; that F (to follow this line) is the Genus of K, and a Species of B, coordinate with D and F; that B is the Genus of F, &c., and a Species of A coordinate with C; and that A is the Genus of B and C, and so far as appears a Genus only. And perhaps this custom is, on the whole the best; or at most it might be an allowable innovation to add to the technical terms of general Logic such a

word as Tribe, in order to designate by appropriate names three Classes (not necessarily Natural Classes) in successive inclusion—Tribe, Genus, Species. The Relations of Tribe and Genus, being the same as those of Genus and Species, do not need particular investigation.

Plainly now a Natural Classification is a vast Logic-machine; exhibiting in the most definite way, at a glance, the Inclusions and Exclusions of all Classes both Immediate and Mediate. A complete Classification would have a place for every thing and every event in the world, according to its closest affinities, displaying the whole hierarchies of Natural Kinds and Causes. And so far as this Classification extended, the labour of proof as to the Relations of Classes, having been accomplished once for all, would ever after be superseded by a glance at the Tables. There would be seen the inclusion of a Species in the Tribe which included its Genus; the exclusion of a Species from another Species having a different Genus: Sorites would be given along all lines from the Species upward above the Tribes. The notion of the Counter Class, too, attains its greatest clearness in this connection by the facilities afforded for defining it. It would naturally in every case not expressly excepted, be circumscribed by the Class next above its Positive: taking any Species, the special Counter Class would be the sum of the other Species of the same Genus; the generic

Counter Class, the sum of the other Genera of the same Tribe.

Thus a Natural Classification is a sort of solidified Logic; and perhaps the best way to begin the study of the Science, is to take some good Classification, and analyse it into the simplest Relations.

CHAPTER X.

OF SECONDARY RELATIONS.

1. *Symbols.*

RELATIONS are Terms; and in as far as they are Terms only, they are related in the same way as others: and the laws of the Relationship of Terms in general, which we have discussed in the preceding Chapters, are in no way modified when the particular Terms concerned happen to be themselves Relations. There are, however, certain Relations of Relations which do not obtain in the same way between mere Terms that are not Relations. Let us call these Secondary Relations, and assign them symbols as follows:

Coincidence	Ω
Noncoincidence	σ
Immediate Implication	Δ
Mediate Implication	π
Nonimplication	Λ
Compatibility	θ
Incompatibility	χ
Imperfect Alteruternity	ϕ
Perfect Alteruternity	ψ

I have hitherto found it possible to do without these symbols; and was unwilling to multiply such entities without necessity. They might have sometimes added to the neatness of the exposition; but this gain must have been counterbalanced by the added burden on the reader's memory. Still such symbols would be useful if generally understood and accepted.

The simpler laws of Secondary Relations we have already dealt with, and shall now only briefly indicate a further line of considerations concerning the laws of the Correlation of these Relations.

2. *Comparison of Secondary Relations.*

Coincidence and Noncoincidence are the simplest sort of Secondary Relations. Coincidence plainly is only the most intimate case of the Coexistence of Relations. Noncoincidence however is not necessarily Noncoexistence; for Relations may coexist without coinciding.

To avoid confusion I will put in brackets the symbols of Relations which are treated as Terms.

$$[\,\Omega\,] \quad \psi \quad [\,\sigma\,]$$

Such is the Relation between Coincidence and Noncoincidence. The way in which they are related to the other Secondary Relations is given by definition; for since they are the simplest the others are defined by reference to them.

Accordingly, Immediate Implication is a kind of Coincidence, as Coincidence is of Coexistence: but Nonimplication is not the same as Noncoincidence: two Relations may coincide, though neither implicate the other. Mediate Implication is exceptional among Secondary Relations; it is not a kind of Coincidence, and often not even of Concomitance, as for instance in Quadriterminal Correlations. But usually the same formula is good for all kinds of Implication, and when this is the case Δ may stand for all.

$$[\Delta] \quad \psi \quad [\Lambda]$$

Compatibility may obtain in the nature of things as between η and ω, or it may subsist upon the incompleteness of our knowledge. In the latter sense—

$$[\theta] \quad \theta \quad [\Delta] \quad \text{or} \quad [\Lambda]$$

But where a Relation of Implication is known—

$$[\Delta] \quad \Delta \quad [\theta]$$

Incompatibility, of course, is defined with reference to Coincidence, and must not be mistaken for a kind of simple Nonconcomitance.

$$\begin{array}{ccc} [\chi] & \chi & [\Delta] \\ [\chi] & \psi & [\theta] \end{array}$$

As to Alteruternity—

$$\begin{array}{ccc} [\phi] & \chi & [\Delta] \\ [\psi] & \chi & [\Delta] \end{array}$$

And by definition—

$$[\phi] \quad \Delta \quad [\theta]$$
$$[\psi] \quad \Delta \quad [\chi]$$

3. *Mediate Relations of Secondary Relations.*

The Mediate Relationship of Secondary Relations falls into the forms of Triterminal Correlation. By taking each sort of Secondary Relation and combining it successively with each of the others, we get a series of Correlations some of which have, and some have not, a definite implication. Vagueness and bare negation are circumstances apt to vitiate these Correlations, as well as those which were reviewed in Chapter IV. It will suffice to give a few examples of evidentiary Correlations of this kind: the Relations related may be signified by *a, b, c*.

1. Coincidence—

$$a \quad \Omega \quad b \quad \Omega \quad c \quad \therefore \quad a \quad \Omega \quad c$$
$$a \quad \Omega \quad b \quad \Delta \quad c \quad \therefore \quad a \quad \Omega \quad c$$
$$a \quad \Omega \quad b \quad \chi \quad c \quad \therefore \quad a \quad \sigma \quad c$$

2. Implication—

$$a \quad \Delta \quad b \quad \Delta \quad c \quad \therefore \quad a \quad \Delta \quad c$$
$$a \quad \Delta \quad b \quad \chi \quad c \quad \therefore \quad a \quad \chi \quad c$$

In the previous Chapter we noticed some cases of the Mediate Relationship of Classes, in which one of the premises was affected by an hypothesis; but

the mediation of Hypothetic Relations in general naturally falls under the principles we are now discussing. Under the above principles, for instance, come such cases as these:—

If A is B, C is D; If C is D, E is F;
∴ If A is B, E is F.
If A is B, C is D; If C is D, E is not F:
∴ If A is B, E is not F.

For we may read them thus:

$$A : B \ \Delta \ C : D \ \Delta \ E : F \ \therefore \ A : B \ \Delta \ E : F.$$
$$A : B \ \Delta \ C : D \ \chi \ D : F \ \therefore \ A : B \ \chi \ E : F.$$

It is indeed possible to disguise such cases as Syllogisms; but such a procedure is no real explanation, the reverse of simplification, and scientifically quite unjustifiable. The practice of treating the syllogistic form as a carpet-bag, into which desperate Logicians squeeze and cram whatever they find no place for elsewhere (the bed of Procrustes is a more dignified, and perhaps a more appropriate comparison), would never have arisen, had not the Syllogism been erroneously believed to be the only legitimate, or even the only possible mode of reasoning and proof.

3. Compatibility—

$$a \ \theta \ b \ \Delta \ c \ \therefore \ a \ \theta \ c.$$

4. Alteruternity. The Secondary Correlations into

which Relations of Alteruternity enter admit of being generalized under the following Rule:

> If two Relations are secondarily related to a third, definitely, and one of them by Alteruternity, they are related to one another by a Relation which is a formal incompatible of the Relation of the other to the third; or their Counters are thus related; or the Counter of one of them is related to the other by the same Relation as the third to the other.

Thus:—

$$a \,\Delta\, b \,\psi\, c \quad \therefore\; a \,\chi\, c$$
$$a \,\chi\, b \,\psi \text{ (or } \phi) \, c \;\therefore\; a \,\Delta\, c.$$

These are the ordinary principles of indirect demonstration * (instead of the first of them, the second principle given above under Implication may serve): as when it is shown that the supposed equality of two lines implicates the equality of two angles, which is in perfect Alteruternity with the known inequality of those angles: or else that the known equality of two lines is incompatible with the supposed inequality of two angles, and therefore implicates the alterutern fact of their equality.

Again, let the Counter of any Relation a be $/a$.

$$a \,\psi \text{ (or } \phi) \, b \,\chi\, c \;\therefore\; /a \,\Delta\, /c.$$

And again,

$$a \,\psi \text{ (or } \phi) \, b \,\Delta\, c \;\therefore\; /a \,\Delta\, c.$$

* Cf. *ante*, Ch. IV. Part II. § 6.

Sometimes a Correlation has more than one implication.

$$a \psi b \psi c \therefore \begin{cases} a \Delta c \\ /a \Delta /c \\ /b \Delta [a \Omega c] \\ b \Delta [/a \Omega /c]. \end{cases}$$

All these formulæ supply means of interpreting hypotheses. Suppose, for instance, we are given the following:

A is either B or C, and not both; and if it is C, it is neither E nor F; but if it is not C, it is either E or F. This may be written out—

$$[A : B] \psi [A : C]; \ [A : C] \psi [A : E \text{ and } A : F]:$$
$$\therefore \text{ 1st. } [A : B] \Delta [A : E \text{ or } A : F]$$
$$\text{2nd. } /[A : B] \Delta /[A : E \text{ and } A : F]$$
$$\text{3rd. } /[A : C] \Delta [A : B \ \Omega \ A : E \text{ or } A : F]$$
$$\text{4th. } [A : C] \Delta [/(A : B) \ \Omega \ /(A : E \text{ and } A : F)].$$

And these implications may be interpreted:

If A is B, it is either E or F.
If A is not B, it is neither E nor F.
If A is not C, it is B, and either E or F.
If A is C, it is neither B, nor E, nor F.

The question arises whether Correlations can be formed by the combination of Primary with Secondary Relations. And the answer is, that such combinations are possible as far as the two orders of Rela-

tions are homogeneous; that is, in as far as Secondary Relations may be viewed as modes of Concomitance or Nonconcomitance. But we saw in § 2 of this Chapter, that whilst Coincidence, Immediate Implication, and Compatibility, were modes of Concomitance, actual or possible, the rest were not necessarily modes of Nonconcomitance, having been defined with reference to Coincidence, and not to Concomitance in general. Hence the possible combinations of Primary Relations with Secondary Incompatibility and Alteruternity, have no necessary implications.

Should we, however, construct Primary Relations of Incompatibility and Alteruternity, defined with reference to Concomitance in general; there would then arise (taking the above symbols in this altered sense) a number of implicative Correlations such as these:—

$$a \ \omega \ b \ \chi \ c \ \therefore \ a \ o \ c$$
$$a \ o \ b \ \psi \ c \ \therefore \ a \ \omega \ c$$
$$a \ \epsilon \ b \ \phi \ c \ \therefore \ a \ v \ c$$

The above then seem to be the most important principles of Secondary Correlation. Many others might be suggested, some of them having implications, and some not; and other principles yet more remote and more complex may remain to be discovered: and there are perhaps still other directions in which the Science may be elaborated. For the

time one of its two larger branches has noticeably outgrown the other; the theory of Quadriterminal Correlation bears a great disproportion to the theory of Triterminal Correlation. This is because the former theory has assimilated the doctrine of Classes; and at present it is certainly not easy to guess where the latter theory will find an equal store of prepared *pabulum*. But some conception no less rich may one day disclose itself; and the life of Science is as long as the pursuit of Science is difficult.

THE END.

LONDON:
BRADBURY, AGNEW, & CO., PRINTERS, WHITEFRIARS.

A LIST OF
C. KEGAN PAUL AND CO.'S PUBLICATIONS.

ABBEY (Henry).
Ballads of Good Deeds, and Other Verses. Fcap. 8vo. Cloth gilt, price 5*s.*

ABDULLA (Hakayit).
Autobiography of a Malay Munshi. Translated by J. T. Thomson, F. R. G. S. With Photo-lithograph Page of Abdulla's MS. Post 8vo. Cloth, price 12*s.*

ADAMS (A. L.), M.A., M.B., F.R.S., F.G.S.
Field and Forest Rambles of a Naturalist in New Brunswick. With Notes and Observations on the Natural History of Eastern Canada. Illustrated. 8vo. Cloth, price 14*s.*

ADAMS (F. O.), F.R.G.S.
The History of Japan. From the Earliest Period to the Present Time. New Edition, revised. 2 volumes. With Maps and Plans. Demy 8vo. Cloth, price 21*s.* each.

ADAMS (W. D.).
Lyrics of Love, from Shakespeare to Tennyson. Selected and arranged by. Fcap. 8vo. Cloth extra, gilt edges, price 3*s.* 6*d.*
Also, a Cheap Edition. Fcap. 8vo. Cloth, price 2*s.* 6*d.*

ADAMS (John), M.A.
St. Malo's Quest, and other Poems. Fcap. 8vo. Cloth, 5*s.*

ADON.
Through Storm & Sunshine. Illustrated by M. E. Edwards, A. T. H. Paterson, and the Author. Crown 8vo. Cloth, price 7*s.* 6*d.*

A. J. R.
Told at Twilight; Stories in Verse, Songs, &c. Fcap. 8vo. Cloth, price 3*s.* 6*d.*

A. K. H. B.
A Scotch Communion Sunday, to which are added Certain Discourses from a University City. By the Author of "The Recreations of a Country Parson." Second Edition. Crown 8vo. Cloth, price 5*s.*

ALBERT (Mary).
Holland and her Heroes to the year 1585. An Adaptation from "Motley's Rise of the Dutch Republic. Small crown 8vo. Cloth, price, 4*s.* 6*d.*

ALLEN (Rev. R.), M.A.
Abraham; his Life, Times, and Travels, 3,800 years ago. Second Edition. With Map. Post 8vo. Cloth, price 6*s.*

ALLEN (Grant), B.A.
Physiological Æsthetics. Crown 8vo. 9*s.*

AMOS (Prof. Sheldon).
Science of Law. Second Edition. Crown 8vo. Cloth, price 5*s.*
Volume X. of The International Scientific Series.

ANDERSON (Rev. C.), M.A.
New Readings of Old Parables. Demy 8vo. Cloth, price 4*s.* 6*d.*

Church Thought and Church Work. Edited by. Second Edition. Demy 8vo. Cloth, price 7*s.* 6*d.*

Words and Works in a London Parish. Edited by. Second Edition. Demy 8vo. Cloth, price 6*s.*

The Curate of Shyre. Second Edition. 8vo. Cloth, price 7*s.* 6*d.*

ANDERSON (Col. R. P.).
Victories and Defeats. An Attempt to explain the Causes which have led to them. An Officer's Manual. Demy 8vo. Cloth, price 14*s.*

ANDERSON (R. C.), C.E.
Tables for Facilitating the Calculation of every Detail in connection with Earthen and Masonry Dams. Royal 8vo. Cloth, price £2 2*s.*

ANSON (Lieut.-Col. The Hon. A.), V.C., M.P.
The Abolition of Purchase and the Army Regulation Bill of 1871. Crown 8vo. Sewed, price 1*s.*

Army Reserves and Militia Reforms. Crown 8vo. Sewed, price 1*s.*

Story of the Supersessions. Crown 8vo. Sewed, price 6*d.*

ARCHER (Thomas).
About my Father's Business. Work amidst the Sick, the Sad, and the Sorrowing. Crown 8vo. Cloth, price 5*s.*

ARGYLE (Duke of).
Speeches on the Second Reading of the Church Patronage (Scotland) Bill in the House of Lords, June 2, 1874; and Earl of Camperdown's Amendment, June 9, 1874, placing the Election of Ministers in the hands of Ratepayers. Crown 8vo. Sewed, price 1*s.*

Army of the North German Confederation.
A Brief Description of its Organization, of the Different Branches of the Service and their *rôle* in War, of its Mode of Fighting, &c., &c. Translated from the Corrected Edition, by permission of the Author, by Colonel Edward Newdigate. Demy 8vo. Cloth, price 5*s.*

ASHTON (J.).
Rough Notes of a Visit to Belgium, Sedan, and Paris, in September, 1870-71. Crown 8vo. Cloth, price 3*s.* 6*d.*

AUBERTIN (J. J.).
Camoens' Lusiads. Portuguese Text, with Translation by. With Map and Portraits. 2 vols. Demy 8vo. Price 30*s.*

Aunt Mary's Bran Pie.
By the author of "St. Olave's." Illustrated. Cloth, price 3*s.* 6*d.*

Aurora.
A Volume of Verse. Fcap. 8vo. Cloth, price 5*s.*

AYRTON (J. C.).
A Scotch Wooing. 2 vols. Crown 8vo. Cloth.

BAGEHOT (Walter).
Some Articles on the Depreciation of Silver, and Topics connected with it. Demy 8vo. Price 5*s.*

Physics and Politics; or, Thoughts on the Application of the Principles of "Natural Selection" and "Inheritance" to Political Society. Third Edition. Crown 8vo. Cloth, price 4*s.*
Volume II. of The International Scientific Series.

The English Constitution. A New Edition, Revised and Corrected, with an Introductory Dissertation on Recent Changes and Events. Crown 8vo. Cloth, price 7*s.* 6*d.*

Lombard Street. A Description of the Money Market. Seventh Edition. Crown 8vo. Cloth, price 7*s.* 6*d.*

BAGOT (Alan).
Accidents in Mines: their Causes and Prevention. Crown 8vo. Cloth, price 6*s.*

BAIN (Alexander), LL.D.
Mind and Body: the Theories of their relation. Fifth Edition. Crown 8vo. Cloth, price 4*s.*
Volume IV. of The International Scientific Series.

BALDWIN (Capt. J. H.), F.Z.S., Bengal Staff Corps.
The Large and Small Game of Bengal and the North-Western Provinces of India. 4to. With numerous Illustrations. Second Edition. Cloth, price 21*s.*

BANKS (Mrs. G. L.).
God's Providence House. New Edition. Crown 8vo. Cloth, price 3*s.* 6*d.*

BARING (T. C.), M.A., M.P.
Pindar in English Rhyme. Being an Attempt to render the Epinikian Odes with the principal remaining Fragments of Pindar into English Rhymed Verse. Small Quarto. Cloth, price 7*s.*

BARLEE (Ellen).

Locked Out: a Tale of the Strike. With a Frontispiece. Royal 16mo. Cloth, price 1*s.* 6*d.*

BARTLEY (George C. T.), Manager of the National Penny Bank.

Domestic Economy: Thrift in Every Day Life. Taught in Dialogues suitable for Children of all ages. Small crown 8vo. Cloth, limp, 2*s.*

BAUR (Ferdinand), Dr. Ph., Professor in Maulbronn.

A Philological Introduction to Greek and Latin for Students. Translated and adapted from the German of. By C. KEGAN PAUL, M.A. Oxon., and the Rev. E. D. STONE, M.A., late Fellow of King's College, Cambridge, and Assistant Master at Eton. Crown 8vo. Cloth, price 6*s.*

BAYNES (Rev. Canon R. H.), M.A.

At the Communion Time. A Manual for Holy Communion. With a preface by the Right Rev. the Lord Bishop of Derry and Raphoe. Cloth, price 1*s.* 6*d.*

*** Can also be had bound in French morocco, price 2*s.* 6*d.*; Persian morocco, price 3*s.*; Calf, or Turkey morocco, price 3*s.* 6*d.*

Home Songs for Quiet Hours. Fourth and cheaper Edition. Fcap. 8vo. Cloth, price 2*s.* 6*d.*

This may also be had handsomely bound in morocco with gilt edges.

BECKER (Bernard H.).

The Scientific Societies of London. Crown 8vo. Cloth, price 5*s.*

BENNETT (Dr. W. C.).

Narrative Poems & Ballads. Fcap. 8vo. Sewed in Coloured Wrapper, price 1*s.*

Songs for Sailors. Dedicated by Special Request to H. R. H. the Duke of Edinburgh. With Steel Portrait and Illustrations. Crown 8vo. Cloth, price 3*s.* 6*d.*

An Edition in Illustrated Paper Covers, price 1*s.*

Songs of a Song Writer. Crown 8vo. Cloth, price 6*s.*

BENNIE (Rev. J. N.), M.A.

The Eternal Life. Sermons preached during the last twelve years. Crown 8vo. Cloth, price 6*s.*

BERNARD (Bayle).

Samuel Lover, the Life and Unpublished Works of. In 2 vols. With a Steel Portrait. Post 8vo. Cloth, price 21*s.*

BERNSTEIN (Prof.).

The Five Senses of Man. With 91 Illustrations. Second Edition. Crown 8vo. Cloth, price 5*s.*

Volume XXI. of The International Scientific Series.

BETHAM-EDWARDS (Miss M.).

Kitty. With a Frontispiece. Crown 8vo. Cloth, price 6*s.*

BISCOE (A. C.).

The Earls of Middleton, Lords of Clermont and of Fettercairn, and the Middleton Family. Crown 8vo. Cloth, price 10*s.* 6*d.*

BISSET (A.)

History of the Struggle for Parliamentary Government in England. 2 vols. Demy 8vo. Cloth, price 24*s.*

BLANC (H.), M.D.

Cholera: How to Avoid and Treat it. Popular and Practical Notes. Crown 8vo. Cloth, price 4*s.* 6*d.*

BLASERNA (Prof. Pietro).

The Theory of Sound in its Relation to Music. With numerous Illustrations. Crown 8vo. Cloth, price 5*s.*

Volume XXII. of The International Scientific Series.

Blue Roses; or, Helen Malinofska's Marriage. By the Author of "Véra." 2 vols. Fifth Edition. Cloth, gilt tops, 12*s.*

*** Also a Cheaper Edition in 1 vol. With frontispiece. Crown 8vo. Cloth, price 6*s.*

BLUME (Major W.).
The Operations of the German Armies in France, from Sedan to the end of the war of 1870-71. With Map. From the Journals of the Head-quarters Staff. Translated by the late E. M. Jones, Maj. 20th Foot, Prof. of Mil. Hist., Sandhurst. Demy 8vo. Cloth, price 9*s.*

BOGUSLAWSKI (Capt. A. von).
Tactical Deductions from the War of 1870-71. Translated by Colonel Sir Lumley Graham, Bart., late 18th (Royal Irish) Regiment. Third Edition, Revised and Corrected. Demy 8vo. Cloth, price 7*s.*

BONWICK (J.), F.R.G.S.
The Tasmanian Lily. With Frontispiece. Crown 8vo. Cloth, price 5*s.*

Mike Howe, the Bushranger of Van Diemen's Land. With Frontispiece. Crown 8vo. Cloth, price 5*s.*

Pyramid Facts and Fancies. Crown 8vo. Cloth price 5*s.*

BOSWELL (R. B.), M.A., Oxon.
Metrical Translations from the Greek and Latin Poets, and other Poems. Crown 8vo. Cloth, price 5*s.*

BOWEN (H. C.), M.A., Head Master of the Grocers' Company's Middle Class School at Hackney.
Studies in English, for the use of Modern Schools. Small Crown 8vo. Cloth, price 1*s.* 6*d.*

BOWRING (L.), C.S.I.
Eastern Experiences. Illustrated with Maps and Diagrams. Demy 8vo. Cloth, price 16*s.*

BOWRING (Sir John).
Autobiographical Recollections. With Memoir by Lewin B. Bowring. Demy 8vo. Price 14*s.*

BRADLEY (F. H.).
Ethical Studies. Critical Essays in Moral Philosophy. Large post 8vo. Cloth, price 9*s.*

Mr. Sidgwick's Hedonism: an Examination of the Main Argument of "The Methods of Ethics." Demy 8vo., sewed, price 2*s.* 6*d.*

Brave Men's Footsteps. By the Editor of "Men who have Risen." A Book of Example and Anecdote for Young People. With Four Illustrations by C. Doyle. Third Edition. Crown 8vo. Cloth, price 3*s.* 6*d.*

BRIALMONT (Col. A.).
Hasty Intrenchments. Translated by Lieut. Charles A. Empson, R.A. With Nine Plates. Demy 8vo. Cloth, price 6*s.*

BROOKE (Rev. J. M. S.), M.A.
Heart, be Still. A Sermon preached in Holy Trinity Church, Southall. Imperial 32mo. Sewed, price 6*d.*

BROOKE (Rev. S. A.), M.A., Chaplain in Ordinary to Her Majesty the Queen, and Minister of Bedford Chapel, Bloomsbury.

The Late Rev. F. W. Robertson, M.A., Life and Letters of. Edited by.

I. Uniform with the Sermons. 2 vols. With Steel Portrait. Price 7*s.* 6*d.*

II. Library Edition. 8vo. With Two Steel Portraits. Price 12*s.*

III. A Popular Edition, in 1 vol. 8vo. Price 6*s.*

Theology in the English Poets. — COWPER, COLERIDGE, WORDSWORTH, and BURNS. Third Edition. Post 8vo. Cloth, price 9*s.*

Christ in Modern Life. Eleventh Edition. Crown 8vo. Cloth, price 7*s.* 6*d.*

Sermons. First Series. Ninth Edition. Crown 8vo. Cloth, price 6*s.*

Sermons. Second Series. Third Edition. Crown 8vo. Cloth, price 7*s.*

The Fight of Faith. Sermons preached on various occasions. Third Edition. Crown 8vo. Cloth, price 7*s.* 6*d.*

Frederick Denison Maurice: The Life and Work of. A Memorial Sermon. Crown 8vo. Sewed, price 1*s.*

BROOKE (W. G.), M.A.
The Public Worship Regulation Act. With a Classified Statement of its Provisions, Notes, and Index. Third Edition, revised and corrected. Crown 8vo. Cloth, price 3*s*. 6*d*.

Six Privy Council Judgments—1850-1872. Annotated by. Third Edition. Crown 8vo. Cloth, price 9*s*.

BROUN (J. A.).
Magnetic Observations at Trevandrum and Augustia Malley. Vol. I. 4to. Cloth, price 63*s*.
The Report from above, separately sewed, price 21*s*.

BROWN (Rev. J. Baldwin), B.A.
The Higher Life. Its Reality, Experience, and Destiny. Fourth Edition. Crown 8vo. Cloth, price 7*s*. 6*d*.

Doctrine of Annihilation in the Light of the Gospel of Love. Five Discourses. Second Edition. Crown 8vo. Cloth, price 2*s*. 6*d*.

BROWN (J. Croumbie), LL.D.
Reboisement in France; or, Records of the Replanting of the Alps, the Cevennes, and the Pyrenees with Trees, Herbage, and Bush. Demy 8vo. Cloth, price 12*s*. 6*d*.

The Hydrology of Southern Africa. Demy 8vo. Cloth, price 10*s*. 6*d*.

BROWNE (Rev. M. E.)
Until the Day Dawn. Four Advent Lectures. Crown 8vo. Cloth, price 2*s*. 6*d*.

BRYANT (W. C.)
Poems. Red-line Edition. With 24 Illustrations and Portrait of the Author. Crown 8vo. Cloth extra, price 7*s*. 6*d*.
A Cheaper Edition, with Frontispiece. Small crown 8vo. Cloth, price 3*s*. 6*d*.

BUCHANAN (Robert).
Poetical Works. Collected Edition, in 3 vols., with Portrait. Crown 8vo. Cloth, price 6*s*. each.

Master-Spirits. Post 8vo. Cloth, price 10*s*. 6*d*.

BULKELEY (Rev. H. J.).
Walled in, and other Poems. Crown 8vo. Cloth, price 5*s*.

BUNNETT (F. E.).
Linked at Last. Crown 8vo. Cloth, price 10*s*. 6*d*.

BURTON (Mrs. Richard).
The Inner Life of Syria, Palestine, and the Holy Land. With Maps, Photographs, and Coloured Plates. 2 vols. Second Edition. Demy 8vo. Cloth, price 24*s*.

CADELL (Mrs. H. M.).
Ida Craven: A Novel. 2 vols. Crown 8vo. Cloth.

CALDERON.
Calderon's Dramas: The Wonder-Working Magician—Life is a Dream—The Purgatory of St. Patrick. Translated by Denis Florence MacCarthy. Post 8vo. Cloth, price 10*s*.

CARLISLE (A. D.), B. A.
Round the World in 1870. A Volume of Travels, with Maps. New and Cheaper Edition. Demy 8vo. Cloth, price 6*s*.

CARNE (Miss E. T.).
The Realm of Truth. Crown 8vo. Cloth, price 5*s*. 6*d*.

CARPENTER (E.).
Narcissus and other Poems. Fcap. 8vo. Cloth, price 5*s*.

CARPENTER (W. B.), LL.D., M.D., F.R.S., &c.
The Principles of Mental Physiology. With their Applications to the Training and Discipline of the Mind, and the Study of its Morbid Conditions. Illustrated. Fourth Edition. 8vo. Cloth, price 12*s*.

CARR (Lisle).
Judith Gwynne. 3 vols. Second Edition. Crown 8vo. Cloth.

CAVALRY OFFICER.
Notes on Cavalry Tactics, Organization, &c. With Diagrams. Demy 8vo, Cloth, price 12*s*.

CHAPMAN (Hon. Mrs. E. W.).

A Constant Heart. A Story. 2 vols. Cloth, gilt tops, price 12*s.*

Children's Toys, and some Elementary Lessons in General Knowledge which they teach. Illustrated. Crown 8vo. Cloth, price 5*s.*

CHRISTOPHERSON (The late Rev. Henry), M.A.

Sermons. With an Introduction by John Rae, LL.D., F.S.A. First Series. Crown 8vo. Cloth, price 7*s.* 6*d.*

Sermons. With an Introduction by John Rae, LL.D., F.S.A. Second Series. Crown 8vo. Cloth, price 6*s.*

CLAYTON (Cecil).

Effie's Game; How She Lost and How She Won. A Novel. 2 vols. Cloth.

CLERK (Mrs. Godfrey).

'Ilâm en Nâs. Historical Tales and Anecdotes of the Times of the Early Khalifahs. Translated from the Arabic Originals. Illustrated with Historical and Explanatory Notes. Crown 8vo. Cloth, price 7*s.*

CLERY (C.), Capt.

Minor Tactics. With 26 Maps and Plans. Third and revised Edition. Demy 8vo. Cloth, price 16*s.*

CLODD (Edward), F.R.A.S.

The Childhood of the World: a Simple Account of Man in Early Times. Third Edition. Crown 8vo. Cloth, price 3*s.*

A Special Edition for Schools. Price 1*s.*

The Childhood of Religions. Including a Simple Account of the Birth and Growth of Myths and Legends. Third Thousand. Crown 8vo. Cloth, price 5*s.*

A Special Edition for Schools. Price 1*s.* 6*d.*

COLERIDGE (Sara).

Pretty Lessons in Verse for Good Children, with some Lessons in Latin, in Easy Rhyme. A New Edition. Illustrated. Fcap. 8vo. Cloth, price 3*s.* 6*d.*

Phantasmion. A Fairy Tale. With an Introductory Preface by the Right Hon. Lord Coleridge, of Ottery St. Mary. A New Edition. Illustrated. Crown 8vo. Cloth, price 7*s.* 6*d.*

Memoir and Letters of Sara Coleridge. Edited by her Daughter. With Index. 2 vols. With Two Portraits. Third Edition, Revised and Corrected. Crown 8vo. Cloth, price 24*s.*

Cheap Edition. With one Portrait. Cloth, price 7*s.* 6*d.*

COLLINS (Mortimer).

The Princess Clarice. A Story of 1871. 2 vols. Cloth.

Squire Silchester's Whim. 3 vols. Cloth.

Miranda. A Midsummer Madness. 3 vols. Cloth.

Inn of Strange Meetings, and other Poems. Crown 8vo. Cloth, price 5*s.*

The Secret of Long Life. Dedicated by special permission to Lord St. Leonards. Fourth Edition. Large crown 8vo. Cloth, price 5*s.*

COLLINS (Rev. R.), M.A.

Missionary Enterprise in the East. With special reference to the Syrian Christians of Malabar, and the results of modern Missions. With Four Illustrations. Crown 8vo. Cloth, price 6*s.*

CONGREVE (Richard), M.A., M.R.C.P.L.

Human Catholicism. Two Sermons delivered at the Positivist School on the Festival of Humanity, 87 and 88, January 1, 1875 and 1876. Demy 8vo. Sewed, price 1*s.*

CONYERS (Ansley).

Chesterleigh. 3 vols. Crown 8vo. Cloth.

COOKE (M. C.), M.A., LL.D.

Fungi; their Nature, Influences, Uses, &c. Edited by the Rev. M. J. Berkeley, M.A., F.L.S. With Illustrations. Second Edition. Crown 8vo. Cloth, price 5*s.*
Volume XIV. of The International Scientific Series.

COOKE (Prof. J. P.), of the Harvard University.

The New Chemistry. With 31 Illustrations. Third Edition. Crown 8vo. Cloth, price 5*s.*
Volume IX. of The International Scientific Series.

Scientific Culture. Crown 8vo. Cloth, price 1*s.*

COOPER (T. T.), F.R.G.S.

The Mishmee Hills: an Account of a Journey made in an Attempt to Penetrate Thibet from Assam, to open New Routes for Commerce. Second Edition. With Four Illustrations and Map. Post 8vo. Cloth, price 10*s.* 6*d.*

Cornhill Library of Fiction (The). Crown 8vo. Cloth, price 3*s.* 6*d.* per volume.

Half-a-Dozen Daughters. By J. Masterman.
The House of Raby. By Mrs. G. Hooper.
A Fight for Life. By Moy Thomas.
Robin Gray. By Charles Gibbon.
One of Two; or, The Left-Handed Bride. By J. Hain Friswell.
God's Providence House. By Mrs. G. L. Banks.
For Lack of Gold. By Charles Gibbon.
Abel Drake's Wife. By John Saunders.
Hirell. By John Saunders.

CORY (Lieut. Col. Arthur).

The Eastern Menace; or, Shadows of Coming Events. Crown 8vo. Cloth, price 5*s.*

Ione. A Poem in Four Parts. Fcap. 8vo. Cloth, price 5*s.*

Cosmos.

A Poem. Fcap. 8vo. Cloth, price 3*s.* 6*d.*

COTTON (R. T.).

Mr. Carington. A Tale of Love and Conspiracy. 3 vols. Crown 8vo. Cloth.

COX (Rev. Samuel).

Salvator Mundi; or, Is Christ the Saviour of all Men? Third Edition. Crown 8vo. Cloth, price 5*s.*

CRESSWELL (Mrs. G.).

The King's Banner. Drama in Four Acts. Five Illustrations. 4to. Cloth, price 10*s.* 6*d.*

CROMPTON (Henry).

Industrial Conciliation. Fcap. 8vo. Cloth, price 2*s.* 6*d.*

CUMMINS (H. I.), M. A.

Parochial Charities of the City of London. Sewed, price 1*s.*

CURWEN (Henry).

Sorrow and Song: Studies of Literary Struggle. Henry Mürger—Novalis—Alexander Petöfi—Honoré de Balzac—Edgar Allan Poe—André Chénier. 2 vols. Crown 8vo. Cloth, price 15*s.*

DANCE (Rev. C. D.).

Recollections of Four Years in Venezuela. With Three Illustrations and a Map. Crown 8vo. Cloth, price 7*s.* 6*d.*

D'ANVERS (N. R.).

The Suez Canal: Letters and Documents descriptive of its Rise and Progress in 1854-56. By Ferdinand de Lesseps. Translated by. Demy 8vo. Cloth, price 10*s.* 6*d.*

Little Minnie's Troubles. An Every-day Chronicle. With Four Illustrations by W. H. Hughes. Fcap. Cloth, price 3*s.* 6*d*

Pixie's Adventures; or, the Tale of a Terrier. With 21 Illustrations. 16mo. Cloth, price 4*s.* 6*d.*

DAVIDSON (Rev. Samuel), D.D., LL.D.

The New Testament, translated from the Latest Greek Text of Tischendorf. A new and thoroughly revised Edition. Post 8vo. Cloth, price 10*s*. 6*d*.

Canon of the Bible: Its Formation, History, and Fluctuations. Second Edition. Small crown 8vo. Cloth, price 5*s*.

DAVIES (G. Christopher).

Mountain, Meadow, and Mere: a Series of Outdoor Sketches of Sport, Scenery, Adventures, and Natural History. With Sixteen Illustrations by Bosworth W. Harcourt. Crown 8vo. Cloth, price 6*s*.

Rambles and Adventures of Our School Field Club. With Four Illustrations. Crown 8vo. Cloth, price 5*s*.

DAVIES (Rev. J. L.), M.A.

Theology and Morality. Essays on Questions of Belief and Practice. Crown 8vo. Cloth, price 7*s*. 6*d*.

DAWSON (George), M.A.

Prayers, with a Discourse on Prayer. Edited by his Wife. Fourth Edition. Crown 8vo. Price 6*s*.

Sermons on Disputed Points and Special Occasions. Second Edition. Crown 8vo. Cloth, price 6*s*.

DE L'HOSTE (Col. E. P.).

The Desert Pastor, Jean Jarousseau. Translated from the French of Eugène Pelletan. With a Frontispiece. New Edition. Fcap. 8vo. Cloth, price 3*s*. 6*d*.

DE REDCLIFFE (Viscount Stratford), P.C., K.G., G.C.B.

Why am I a Christian? Fifth Edition. Crown 8vo. Cloth, price 3*s*.

DE TOCQUEVILLE (A.).

Correspondence and Conversations of, with Nassau William Senior, from 1834 to 1859. Edited by M. C. M. Simpson. 2 vols. Post 8vo. Cloth, price 21*s*.

DE VERE (Aubrey).

Alexander the Great. A Dramatic Poem. Small crown 8vo. Cloth, price 5*s*.

The Infant Bridal, and Other Poems. A New and Enlarged Edition. Fcap. 8vo. Cloth price 7*s*. 6*d*.

The Legends of St. Patrick, and Other Poems. Small crown 8vo. Cloth, price 5*s*.

St. Thomas of Canterbury. A Dramatic Poem. Large fcap. 8vo. Cloth, price 5*s*.

Antar and Zara: an Eastern Romance. INISFAIL, and other Poems, Meditative and Lyrical. Fcap. 8vo. Price 6*s*.

The Fall of Rora, the Search after Proserpine, and other Poems, Meditative and Lyrical. Fcap. 8vo. Price 6*s*.

DE WILLE (E.).

Under a Cloud; or, Johannes Olaf. A Novel. Translated by F. E. Bunnètt. 3 vols. Crown 8vo. Cloth.

DENNIS (J.).

English Sonnets. Collected and Arranged. Elegantly bound. Fcap. 8vo. Cloth, price 3*s*. 6*d*.

DOBSON (Austin).

Vignettes in Rhyme and Vers de Société. Third Edition. Fcap. 8vo. Cloth, price 5*s*.

Proverbs in Porcelain. By the Author of "Vignettes in Rhyme" Crown 8vo. 6*s*.

DOWDEN (Edward), LL.D.

Shakspere: a Critical Study of his Mind and Art. Third Edition. Post 8vo. Cloth, price 12*s.*

Poems. Second Edition. Fcap. 8vo. Cloth, price 5*s.*

Studies in Literature, 1789-1877. Demy 8vo. Cloth.

DOWNTON (Rev. H.), M.A.

Hymns and Verses. Original and Translated. Small crown 8vo. Cloth, price 3*s.* 6*d.*

DRAPER (J. W.), M.D., LL.D., Professor in the University of New York.

History of the Conflict between Religion and Science. Ninth Edition. Crown 8vo. Cloth, price 5*s.*

Volume XIII. of The International Scientific Series.

DREW (Rev. G. S.), M.A.

Scripture Lands in connection with their History. Second Edition. 8vo. Cloth, price 10*s.* 6*d.*

Nazareth: Its Life and Lessons. Third Edition. Crown 8vo. Cloth, price 5*s.*

The Divine Kingdom on Earth as it is in Heaven. 8vo. Cloth, price 10*s.* 6*d.*

The Son of Man: His Life and Ministry. Crown 8vo. Cloth, price 7*s.* 6*d.*

DREWRY (G. O.), M.D.

The Common-Sense Management of the Stomach. Third Edition. Fcap. 8vo. Cloth, price 2*s.* 6*d.*

DREWRY (G. O.), M.D., and BARTLETT (H. C.), Ph.D., F.C.S.

Cup and Platter: or, Notes on Food and its Effects. Small 8vo. Cloth, price 2*s.* 6*d.*

DRUMMOND (Miss).

Tripps Buildings. A Study from Life, with Frontispiece. Small crown 8vo. Cloth, price 3*s.* 6*d.*

DURAND (Lady).

Imitations from the German of Spitta and Terstegen. Fcap. 8vo. Cloth, price 4*s.*

DU VERNOIS (Col. von Verdy).

Studies in leading Troops. An authorized and accurate Translation by Lieutenant H. J. T. Hildyard, 71st Foot. Parts I. and II. Demy 8vo. Cloth, price 7*s.*

EDEN (Frederick).

The Nile without a Dragoman. Second Edition. Crown 8vo. Cloth, price 7*s.* 6*d.*

EDMONDS (Herbert).

Well Spent Lives: a Series of Modern Biography. Crown 8vo. Price 5*s.*

EDWARDS (Rev. Basil).

Minor Chords; Or, Songs for the Suffering: a Volume of Verse. Fcap. 8vo. Cloth, price 3*s.* 6*d.*; paper, price 2*s.* 6*d.*

EILOART (Mrs.).

Lady Moretoun's Daughter. 3 vols. Crown 8vo. Cloth.

ELLIOT (Lady Charlotte).

Medusa and other Poems. Crown 8vo. Cloth, price 6*s.*

ELLIOTT (Ebenezer), The Corn Law Rhymer.

Poems. Edited by his son, the Rev. Edwin Elliott, of St. John's, Antigua. 2 vols. Crown 8vo. Cloth, price 18*s.*

ELSDALE (Henry).

Studies in Tennyson's Idylls. Crown 8vo. Cloth, price 5*s.*

ENGLISH CLERGYMAN.

An Essay on the Rule of Faith and Creed of Athanasius. Shall the Rubric preceding the Creed be removed from the Prayer-book? Sewed. 8vo. Price 1*s.*

Epic of Hades (The).

By a New Writer. Author of "Songs of Two Worlds." Fourth and finally revised Edition. Fcap. 8vo. Cloth, price 7*s.* 6*d.*

Eros Agonistes.
Poems. By E. B. D. Fcap. 8vo. Cloth, price 3*s*. 6*d*.

Essays on the Endowment of Research.
By Various Writers.

List of Contributors.
Mark Pattison, B. D.
James S. Cotton, B. A.
Charles E. Appleton, D. C. L.
Archibald H. Sayce, M. A.
Henry Clifton Sorby, F. R. S.
Thomas K. Cheyne, M. A.
W. T. Thiselton Dyer, M. A.
Henry Nettleship, M. A.
Square crown octavo. Cloth, price 10*s*. 6*d*.

EVANS (Mark).
The Gospel of Home Life. Crown 8vo. Cloth, price 4*s*. 6*d*.

The Story of our Father's Love, told to Children; being a New and Enlarged Edition of Theology for Children. With Four Illustrations. Fcap. 8vo. Cloth, price 3*s*. 6*d*.

A Book of Common Prayer and Worship for Household Use, compiled exclusively from the Holy Scriptures. Fcap. 8vo. Cloth, price 2*s*. 6*d*.

EX-CIVILIAN.
Life in the Mofussil: or, Civilian Life in Lower Bengal. 2 vols. Large post 8vo. Price 14*s*.

EYRE (Maj.-Gen. Sir V.), C.B., K.C.S.I., &c.
Lays of a Knight-Errant in many Lands. Square crown 8vo. With Six Illustrations. Cloth, price 7*s*. 6*d*.

FAITHFULL (Mrs. Francis G.).
Love Me, or Love Me Not. 3 vols. Crown 8vo. Cloth.

FARQUHARSON (M.).
I. Elsie Dinsmore. Crown 8vo. Cloth, price 3*s*. 6*d*.

II. Elsie's Girlhood. Crown 8vo. Cloth, price 3*s*. 6*d*.

III. Elsie's Holidays at Roselands. Crown 8vo. Cloth, price 3*s*. 6*d*.

FAVRE (Mons. J.).
The Government of the National Defence. From the 30th June to the 31st October, 1870. Translated by H. Clark. Demy 8vo. Cloth, price 10*s*. 6*d*.

FENN (G. M.).
A Little World. A Novel, in 3 vols.

FERRIS (Henry Weybridge).
Poems. Fcap. 8vo. Cloth, price 5*s*.

FISHER (Alice).
His Queen. 3 vols. Crown 8vo. Cloth.

Folkestone Ritual Case (The). The Argument, Proceedings Judgment, and Report, revised by the several Counsel engaged. Demy 8vo. Cloth, price 25*s*.

FOOTMAN (Rev. H.), M.A.
From Home and Back; or, Some Aspects of Sin as seen in the Light of the Parable of the Prodigal. Crown 8vo. Cloth, price 5*s*.

FOTHERGILL (Jessie).
Aldyth: A Novel. 2 vols. Crown 8vo. Cloth, 21*s*.

Healey. A Romance. 3 vols. Crown 8vo. Cloth.

FOWLE (Rev. Edmund).
Latin Primer Rules made Easy. Crown 8vo. Cloth, price 3*s*.

FOWLE (Rev. T. W.), M.A.
The Reconciliation of Religion and Science. Being Essays on Immortality, Inspiration, Miracles, and the Being of Christ. Demy 8vo. Cloth, price 10*s*. 6*d*.

FOX-BOURNE (H. R.).
The Life of John Locke, 1632—1704. 2 vols. Demy 8vo. Cloth, price 28*s*.

FRASER (Donald).
Exchange Tables of Sterling and Indian Rupee Currency, upon a new and extended system, embracing Values from One Farthing to One Hundred Thousand Pounds, and at Rates progressing, in Sixteenths of a Penny, from 1*s*. 9*d*. to 2*s*. 3*d*. per Rupee. Royal 8vo. Cloth, price 10*s*. 6*d*.

FRISWELL (J. Hain).

The Better Self. Essays for Home Life. Crown 8vo. Cloth, price 6*s.*

One of Two; or, The Left-Handed Bride. With a Frontispiece. Crown 8vo. Cloth, price 3*s.* 6*d.*

FYTCHE (Lieut.-Gen. Albert), C.S.I., late Chief Commissioner of British Burma.

Burma Past and Present, with Personal Reminiscences of the Country. With Steel Portraits, Chromolithographs, Engravings on Wood, and Map. 2 vols. Demy 8vo. Cloth, price 30*s.*

GAMBIER (Capt. J. W.), R.N.

Servia. Crown 8vo. Cloth, price 5*s.*

GARDNER (H.).

Sunflowers. A Book of Verses. Fcap. 8vo. Cloth, price 5*s.*

GARDNER (J.), M.D.

Longevity: The Means of Prolonging Life after Middle Age. Fourth Edition, revised and enlarged. Small crown 8vo. Cloth, price 4*s.*

GARRETT (E.).

By Still Waters. A Story for Quiet Hours. With Seven Illustrations. Crown 8vo. Cloth, price 6*s.*

GIBBON (Charles).

For Lack of Gold. With a Frontispiece. Crown 8vo. Illustrated Boards, price 2*s.*

Robin Gray. With a Frontispiece. Crown 8vo. Illustrated boards, price 2*s.*

GILBERT (Mrs.).

Autobiography and other Memorials. Edited by Josiah Gilbert. Third Edition. With Portrait and several Wood Engravings. Crown 8vo. Cloth, price 7*s.* 6*d.*

GILL (Rev. W. W.), B.A.

Myths and Songs from the South Pacific. With a Preface by F. Max Müller, M.A., Professor of Comparative Philology at Oxford. Post 8vo. Cloth, price 9*s.*

GODKIN (James).

The Religious History of Ireland: Primitive, Papal, and Protestant. Including the Evangelical Missions, Catholic Agitations, and Church Progress of the last half Century. 8vo. Cloth, price 12*s.*

GOETZE (Capt. A. von).

Operations of the German Engineers during the War of 1870-1871. Published by Authority, and in accordance with Official Documents. Translated from the German by Colonel G. Graham, V.C., C.B., R.E. With 6 large Maps. Demy 8vo. Cloth, price 21*s.*

GODWIN (William).

William Godwin: His Friends and Contemporaries. With Portraits and Facsimiles of the handwriting of Godwin and his Wife. By C. Kegan Paul. 2 vols. Demy 8vo. Cloth, price 28*s.*

The Genius of Christianity Unveiled. Being Essays never before published. Edited, with a Preface, by C. Kegan Paul. Crown 8vo. Cloth, price 7*s.* 6*d.*

GOLDIE (Lieut. M. H. G.)

Hebe: a Tale. Fcap. 8vo. Cloth, price 5*s.*

GOODENOUGH (Commodore J. G.), R.N., C.B., C.M.G.

Memoir of, with Extracts from his Letters and Journals. Edited by his Widow. With Steel Engraved Portrait. Square 8vo. Cloth, 5*s.*

*** Also a Library Edition with Maps, Woodcuts, and Steel Engraved Portrait. Square post 8vo. Cloth, price 14*s.*

GOODMAN (W.).

Cuba, the Pearl of the Antilles. Crown 8vo. Cloth, price 7*s.* 6*d.*

GOULD (Rev. S. Baring), M.A.

The Vicar of Morwenstow: a Memoir of the Rev. R. S. Hawker. With Portrait. Third Edition, revised. Square post 8vo. Cloth, 10*s.* 6*d.*

GRANVILLE (A. B.), M.D., F.R.S., &c.

Autobiography of A. B. Granville, F.R.S., etc. Edited, with a brief account of the concluding years of his life, by his youngest Daughter, Paulina B. Granville. 2 vols. With a Portrait. Second Edition. Demy 8vo. Cloth, price 32*s.*

GRAY (Mrs. Russell).

Lisette's Venture. A Novel. 2 vols. Crown 8vo. Cloth.

GREY (John), of Dilston.

John Grey (of Dilston): Memoirs. By Josephine E. Butler. New and Revised Edition. Crown 8vo. Cloth, price 3*s.* 6*d.*

GRIFFITH (Rev. T.), A.M.

Studies of the Divine Master. Demy 8vo. Cloth, price 12*s.*

GRIFFITHS (Capt. Arthur).

Memorials of Millbank, and Chapters in Prison History. With Illustrations by R. Goff and the Author. 2 vols. Post 8vo. Cloth, price 21*s.*

The Queen's Shilling. A Novel. 2 vols. Cloth.

GRIMLEY (Rev. H. N.), M.A., Professor of Mathematics in the University College of Wales.

Tremadoc Sermons, chiefly on the SPIRITUAL BODY, the UNSEEN WORLD, and the DIVINE HUMANITY. Second Edition. Crown 8vo. Cloth, price 6*s.*

GRÜNER (M. L.).

Studies of Blast Furnace Phenomena. Translated by L. D. B. Gordon, F.R.S.E., F.G.S. Demy 8vo. Cloth, price 7*s.* 6*d.*

GURNEY (Rev. Archer).

Words of Faith and Cheer. A Mission of Instruction and Suggestion. Crown 8vo. Cloth, price 6*s.*

First Principles in Church and State. Demy 8vo. Sewed, price 1*s.* 6*d.*

HAECKEL (Prof. Ernst).

The History of Creation. Translation revised by Professor E. Ray Lankester, M.A., F.R.S. With Coloured Plates and Genealogical Trees of the various groups of both plants and animals. 2 vols. Second Edition. Post 8vo. Cloth, price 32*s.*

The History of the Evolution of Man. With numerous Illustrations. 2 vols. Post 8vo.

HARCOURT (Capt. A. F. P.).

The Shakespeare Argosy. Containing much of the wealth of Shakespeare's Wisdom and Wit, alphabetically arranged and classified. Crown 8vo. Cloth, price 6*s.*

HARDY (Thomas).

A Pair of Blue Eyes. New Edition. Crown 8vo. Cloth, price 6*s.*

HARRISON (Lieut.-Col. R.).

The Officer's Memorandum Book for Peace and War. Oblong 32mo. roan, elastic band and pencil, price 2*s.* 6*d.*; russia, 5*s.*

HAWEIS (Rev. H. R.), M.A.

Current Coin. Materialism—The Devil—Crime—Drunkenness—Pauperism—Emotion—Recreation—The Sabbath. Crown 8vo. Cloth, price 6*s.*

Speech in Season. Third Edition. Crown 8vo. Cloth, price 9*s.*

HAWEIS (Rev. H. R.)—*continued.*

Thoughts for the Times. Tenth Edition. Crown 8vo. Cloth, price 7*s.* 6*d.*

Unsectarian Family Prayers, for Morning and Evening for a Week, with short selected passages from the Bible. Square crown 8vo. Cloth, price 3*s.* 6*d.*

HAWTHORNE (Julian).

Bressant. A Romance. 2 vols. Crown 8vo. Cloth.

Idolatry. A Romance. 2 vols. Crown 8vo. Cloth.

HAWTHORNE (Nathaniel).

Septimius. A Romance. Second Edition. Crown 8vo. Cloth, price 9*s.*

HAYMAN (H.), D.D., late Head Master of Rugby School.

Rugby School Sermons. With an Introductory Essay on the Indwelling of the Holy Spirit. Crown 8vo. Cloth, price 7*s.* 6*d.*

Heathergate.

A Story of Scottish Life and Character. By a New Author. 2 vols. Crown 8vo. Cloth.

HELLWALD (Baron F. von).

The Russians in Central Asia. A Critical Examination, down to the present time, of the Geography and History of Central Asia. Translated by Lieut.-Col. Theodore Wirgman, LL.B. Large post 8vo. With Map. Cloth, price 12*s.*

HELVIG (Major H.).

The Operations of the Bavarian Army Corps. Translated by Captain G. S. Schwabe. With Five large Maps. In 2 vols. Demy 8vo. Cloth, price 24*s.*

Tactical Examples: Vol. I. The Battalion, price 15*s.* Vol. II. The Regiment and Brigade, price 10*s.* 6*d.* Translated from the German by Col. Sir Lumley Graham. With numerous Diagrams. Demy 8vo. Cloth.

HERFORD (Brooke).

The Story of Religion in England. A Book for Young Folk. Crown 8vo. Cloth, price 5*s.*

HINTON (James).

Life and Letters of. Edited by Ellice Hopkins, with an Introduction by Sir W. W. Gull, Bart., and Portrait engraved on Steel by C. H. Jeens. Crown 8vo. Cloth, 8*s.* 6*d.*

The Place of the Physician. To which is added ESSAYS ON THE LAW OF HUMAN LIFE, AND ON THE RELATION BETWEEN ORGANIC AND INORGANIC WORLDS. Second Edition. Crown 8vo. Cloth, price 3*s.* 6*d.*

Physiology for Practical Use. By various Writers. With 50 Illustrations. 2 vols. Second Edition. Crown 8vo. Cloth, price 12*s.* 6*d.*

An Atlas of Diseases of the Membrana Tympani. With Descriptive Text. Post 8vo. Price £6 6*s.*

The Questions of Aural Surgery. With Illustrations. 2 vols. Post 8vo. Cloth, price 12*s.* 6*d.*

H. J. C.

The Art of Furnishing. A Popular Treatise on the Principles of Furnishing, based on the Laws of Common Sense, Requirement, and Picturesque Effect. Small crown 8vo. Cloth, price 3*s.* 6*d.*

HOCKLEY (W. B.).

Tales of the Zenana; or, A Nuwab's Leisure Hours. By the Author of "Pandurang Hari." With a Preface by Lord Stanley of Alderley. 2 vols. Crown 8vo. Cloth, price 21*s.*

Pandurang Hari; or, Memoirs of a Hindoo. A Tale of Mahratta Life sixty years ago. With a Preface by Sir H. Bartle E. Frere, G.C.S.I., &c. 2 vols. Crown 8vo. Cloth, price 21*s.*

HOFFBAUER (Capt.).

The German Artillery in the Battles near Metz. Based on the official reports of the German Artillery. Translated by Capt. E. O. Hollist. With Map and Plans. Demy 8vo. Cloth, price 21*s.*

Hogan, M.P.

A Novel. 3 vols. Crown 8vo. Cloth.

HOLMES (E. G. A.).
Poems. Fcap. 8vo. Cloth, price 5*s.*

HOLROYD (Major W. R. M.).
Tas-hil ul Kālām; or, Hindustani made Easy. Crown 8vo. Cloth, price 5*s.*

HOOPER (Mary).
Little Dinners: How to Serve them with Elegance and Economy. Thirteenth Edition. Crown 8vo. Cloth, price 5*s.*

Cookery for Invalids, Persons of Delicate Digestion, and Children. Crown 8vo. Cloth, price 3*s.* 6*d.*

Every-Day Meals. Being Economical and Wholesome Recipes for Breakfast, Luncheon, and Supper. Crown 8vo. Cloth, price 5*s.*

HOOPER (Mrs. G.).
The House of Raby. With a Frontispiece. Crown 8vo. Cloth, price 3*s.* 6*d.*

HOPKINS (Ellice).
Life and Letters of James Hinton, with an Introduction by Sir W. W. Gull, Bart., and Portrait engraved on Steel by C. H. Jeens. Crown 8vo. Cloth, price 8*s.* 6*d.*

HOPKINS (M.).
The Port of Refuge; or, Counsel and Aid to Shipmasters in Difficulty, Doubt, or Distress. Crown 8vo. Second and Revised Edition. Cloth, price 6*s.*

HORNE (William), M.A.
Reason and Revelation: an Examination into the Nature and Contents of Scripture Revelation, as compared with other Forms of Truth. Demy 8vo. Cloth, price 12*s.*

HORNER (The Misses).
Walks in Florence. A New and thoroughly Revised Edition. 2 vols. crown 8vo. Cloth limp. With Illustrations.
Vol. I.—Churches, Streets, and Palaces. 10*s.* 6*d.* Vol. II.—Public Galleries and Museums. 5*s.*

HOWARD (Mary M.).
Beatrice Aylmer, and other Tales. Crown 8vo. Cloth, price 6*s.*

HOWARD (Rev. G. B.).
An Old Legend of St. Paul's. Fcap. 8vo. Cloth, price 4*s.* 6*d.*

HOWELL (James).
A Tale of the Sea, Sonnets, and other Poems. Fcap. 8vo. Cloth, price 5*s.*

HUGHES (Allison).
Penelope and other Poems. Fcap. 8vo. Cloth, price 4*s.* 6*d.*

HULL (Edmund C. P.).
The European in India. With a MEDICAL GUIDE FOR ANGLO-INDIANS. By R. R. S. Mair, M.D., F.R.C.S.E. Second Edition, Revised and Corrected. Post 8vo. Cloth, price 6*s.*

HUMPHREY (Rev. W.).
Mr. Fitzjames Stephen and Cardinal Bellarmine. Demy 8vo. Sewed, price 1*s.*

HUTTON (James).
Missionary Life in the Southern Seas. With Illustrations. Crown 8vo. Cloth, price 7*s.* 6*d.*

IGNOTUS.
Culmshire Folk. A Novel. New and Cheaper Edition. Crown 8vo. Cloth, price 6*s.*

INCHBOLD (J. W.).
Annus Amoris. Sonnets. Foolscap 8vo. Cloth, price 4*s.* 6*d.*

INGELOW (Jean).
The Little Wonder-horn. A Second Series of "Stories Told to a Child." With Fifteen Illustrations. Small 8vo. Cloth, price 2*s.* 6*d.*

Off the Skelligs. (Her First Romance.) 4 vols. Crown 8vo. Cloth.

Indian Bishoprics. By an Indian Churchman. Demy 8vo. 6*d.*

International Scientific Series (The).

I. The Forms of Water in Clouds and Rivers, Ice and Glaciers. By J. Tyndall, LL.D., F.R.S. With 25 Illustrations. Seventh Edition. Crown 8vo. Cloth, price 5*s.*

International Scientific Series (The)—*continued.*

II. **Physics and Politics**; or, Thoughts on the Application of the Principles of "Natural Selection" and "Inheritance" to Political Society. By Walter Bagehot. Fourth Edition. Crown 8vo. Cloth, price 4*s.*

III. **Foods.** By Edward Smith, M.D., LL.B., F.R.S. With numerous Illustrations. Fifth Edition. Crown 8vo. Cloth, price 5*s.*

IV. **Mind and Body**: The Theories of their Relation. By Alexander Bain, LL.D. With Four Illustrations. Fifth Edition. Crown 8vo. Cloth, price 4*s.*

V. **The Study of Sociology.** By Herbert Spencer. Sixth Edition. Crown 8vo. Cloth, price 5*s.*

VI. **On the Conservation of Energy.** By Balfour Stewart, M.A., LL.D., F.R.S. With 14 Illustrations. Fourth Edition. Crown 8vo. Cloth, price 5*s.*

VII. **Animal Locomotion**; or, Walking, Swimming, and Flying. By J. B. Pettigrew, M.D., F.R.S., etc. With 130 Illustrations. Second Edition. Crown 8vo. Cloth, price 5*s.*

VIII. **Responsibility in Mental Disease.** By Henry Maudsley, M.D. Third Edition. Crown 8vo. Cloth, price 5*s.*

IX. **The New Chemistry.** By Professor J. P. Cooke, of the Harvard University. With 31 Illustrations. Fourth Edition. Crown 8vo. Cloth, price 5*s.*

X. **The Science of Law.** By Professor Sheldon Amos. Third Edition. Crown 8vo. Cloth, price 5*s.*

XI. **Animal Mechanism.** A Treatise on Terrestrial and Aerial Locomotion. By Professor E. J. Marey. With 117 Illustrations. Second Edition. Crown 8vo. Cloth, price 5*s.*

XII. **The Doctrine of Descent and Darwinism.** By Professor Oscar Schmidt (Strasburg University). With 26 Illustrations. Third Edition. Crown 8vo. Cloth, price 5*s.*

International Scientific Series (The)—*continued.*

XIII. **The History of the Conflict between Religion and Science.** By J. W. Draper, M.D., LL.D. Eleventh Edition. Crown 8vo. Cloth, price 5*s.*

XIV. **Fungi**; their Nature, Influences, Uses, &c. By M. C. Cooke, M.A., LL.D. Edited by the Rev. M. J. Berkeley, M.A., F.L.S. With numerous Illustrations. Second Edition. Crown 8vo. Cloth, price 5*s.*

XV. **The Chemical Effects of Light and Photography.** By Dr. Hermann Vogel (Polytechnic Academy of Berlin). With 100 Illustrations. Third and Revised Edition. Crown 8vo. Cloth, price 5*s.*

XVI. **The Life and Growth of Language.** By William Dwight Whitney, Professor of Sanskrit and Comparative Philology in Yale College, New Haven. Second Edition. Crown 8vo. Cloth, price

XVII. **Money and the Mechanism of Exchange.** By W. Stanley Jevons, M.A., F.R.S. Third Edition. Crown 8vo. Cloth, price 5*s.*

XVIII. **The Nature of Light**: With a General Account of Physical Optics. By Dr. Eugene Lommel, Professor of Physics in the University of Erlangen. With 188 Illustrations and a table of Spectra in Chromo-lithography. Second Edition. Crown 8vo. Cloth, price 5*s.*

XIX. **Animal Parasites and Messmates.** By Monsieur Van Beneden, Professor of the University of Louvain, Correspondent of the Institute of France. With 83 Illustrations. Second Edition. Crown 8vo. Cloth, price 5*s.*

XX. **Fermentation.** By Professor Schützenberger, Director of the Chemical Laboratory at the Sorbonne. With 28 Illustrations. Second Edition. Crown 8vo. Cloth, price 5*s.*

XXI. **The Five Senses of Man.** By Professor Bernstein, of the University of Halle. With 91 Illustrations. Second Edition. Crown 8vo. Cloth, price 5*s.*

International Scientific Series (The)—*continued.*

XXII. The Theory of Sound in its Relation to Music. By Professor Pietro Blaserna, of the Royal University of Rome. With numerous Illustrations. Second Edition. Crown 8vo. Cloth, price 5*s*.

XXIII. Studies in Spectrum Analysis. By J. Norman Lockyer. F.R.S. With six photographic Illustrations of Spectra, and numerous engravings on wood. Crown 8vo. Cloth, price 6*s*. 6*d*.

Forthcoming Volumes.

Prof. W. Kingdon Clifford, M.A. The First Principles of the Exact Sciences explained to the Non-mathematical.

W. B. Carpenter, LL.D., F.R.S. The Physical Geography of the Sea.

Sir John Lubbock, Bart., F.R.S. On Ants and Bees.

Prof. W. T. Thiselton Dyer, B.A., B.Sc. Form and Habit in Flowering Plants.

Prof. Michael Foster, M.D. Protoplasm and the Cell Theory.

H. Charlton Bastian, M.D., F.R.S. The Brain as an Organ of Mind.

Prof. A. C. Ramsay, LL.D., F.R.S. Earth Sculpture: Hills, Valleys, Mountains, Plains, Rivers, Lakes; how they were Produced, and how they have been Destroyed.

P. Bert (Professor of Physiology, Paris). Forms of Life and other Cosmical Conditions.

Prof. T. H. Huxley. The Crayfish: an Introduction to the Study of Zoology.

The Rev. A Secchi, D.J., late Director of the Observatory at Rome. The Stars.

Prof. J. Rosenthal, of the University of Erlangen. General Physiology of Muscles and Nerves.

Prof. A. de Quatrefages, Membre de l'Institut. The Human Race.

International Scientific Series (The).

Forthcoming Vols.—continued.

Prof. Thurston. The Steam Engine. With numerous Engravings.

Francis Galton, F.R.S. Psychometry.

J. W. Judd, F.R.S. The Laws of Volcanic Action.

Prof. F. N. Balfour. The Embryonic Phases of Animal Life.

J. Luys, Physician to the Hospice de la Salpétrière. The Brain and its Functions. With Illustrations.

Dr. Carl Semper. Animals and their Conditions of Existence.

Prof. Wurtz. Atoms and the Atomic Theory.

George J. Romanes, F.L.S. Animal Intelligence.

Alfred W. Bennett. A Handbook of Cryptogamic Botany.

JACKSON (T. G.).

Modern Gothic Architecture. Crown 8vo. Cloth, price 5*s*.

JACOB (Maj.-Gen. Sir G. Le Grand), K.C.S.I., C.B.

Western India Before and during the Mutinies. Pictures drawn from life. Second Edition. Crown 8vo. Cloth, price 7*s*. 6*d*.

JENKINS (E.) and RAYMOND (J.), Esqs.

A Legal Handbook for Architects, Builders, and Building Owners. Second Edition Revised. Crown 8vo. Cloth, price 6*s*.

JENKINS (Rev. R. C.), M.A.

The Privilege of Peter and the Claims of the Roman Church confronted with the Scriptures, the Councils, and the Testimony of the Popes themselves. Fcap. 8vo. Cloth, price 3*s*. 6*d*.

JENNINGS (Mrs. Vaughan).

Rahel: Her Life and Letters. With a Portrait from the Painting by Daffinger. Square post 8vo. Cloth, price 7*s*. 6*d*.

JEVONS (W. Stanley), M.A., F.R.S.

Money and the Mechanism of Exchange. Second Edition. Crown 8vo. Cloth, price 5*s*.

Volume XVII. of The International Scientific Series.

JONES (Lucy).

Puddings and Sweets. Being Three Hundred and Sixty-Five Receipts approved by Experience. Crown 8vo., price 2*s*. 6*d*.

KAUFMANN (Rev. M.), B.A.

Socialism: Its Nature, its Dangers, and its Remedies considered. Crown 8vo. Cloth, price 7*s*. 6*d*.

KEATINGE (Mrs.).

Honor Blake: The Story of a Plain Woman. 2 vols. Crown 8vo. Cloth.

KER (David).

The Boy Slave in Bokhara. A Tale of Central Asia. With Illustrations. Crown 8vo. Cloth, price 5*s*.

The Wild Horseman of the Pampas. Illustrated. Crown 8vo. Cloth, price 5*s*.

KING (Alice).

A Cluster of Lives. Crown 8vo. Cloth, price 7*s*. 6*d*.

KING (Mrs. Hamilton).

The Disciples. A Poem. Third Edition, with some Notes. Crown 8vo. Cloth, price 7*s*. 6*d*.

Aspromonte, and other Poems. Second Edition. Fcap. 8vo. Cloth, price 4*s*. 6*d*.

KINGSFORD (Rev. F.W.), M.A., Vicar of St. Thomas's, Stamford Hill; late Chaplain H. E. I. C. (Bengal Presidency).

Hartham Conferences; or, Discussions upon some of the Religious Topics of the Day. "Audi alteram partem." Crown 8vo. Cloth, price 3*s*. 6*d*.

KINGSLEY (Charles), M.A.

Letters and Memories of his Life. Edited by his WIFE. With 2 Steel engraved Portraits and numerous Illustrations on Wood, and a Facsimile of his Handwriting. Eleventh Edition. 2 vols., demy 8vo. Cloth, price 36*s*.

All Saint's Day and other Sermons. Second Edition. Crown 8vo. Cloth, 7*s*. 6*d*.

KNIGHT (A. F. C.).

Poems. Fcap 8vo. Cloth, price 5*s*.

LACORDAIRE (Rev. Père).

Life: Conferences delivered at Toulouse. A New and Cheaper Edition. Crown 8vo. Cloth, price 3*s*. 6*d*.

Lady of Lipari (The).

A Poem in Three Cantos. Fcap. 8vo. Cloth, price 5*s*.

LAMBERT (Cowley), F.R.G.S.

A Trip to Cashmere and Ladâk. With numerous Illustrations. Crown 8vo. Cloth, 7*s*. 6*d*.

LAURIE (J. S.).

Educational Course of Secular School Books for India:

The First Hindustani Reader. Stiff linen wrapper, price 6*d*.

The Second Hindustani Reader. Stiff linen wrapper, price 6*d*.

The Oriental (English) Reader. Book I., price 6*d*.; II., price 7½*d*.; III., price 9*d*.; IV., price 1*s*.

Geography of India; with Maps and Historical Appendix, tracing the Growth of the British Empire in Hindustan. Fcap. 8vo. Cloth, price 1*s*. 6*d*.

LAYMANN (Capt.).

The Frontal Attack of Infantry. Translated by Colonel Edward Newdigate. Crown 8vo. Cloth, price 2*s*. 6*d*.

L. D. S.

Letters from China and Japan. With Illustrated Title-page. Crown 8vo. Cloth, price 7*s*. 6*d*.

LEANDER (Richard).

Fantastic Stories. Translated from the German by Paulina B. Granville. With Eight full-page Illustrations by M. E. Fraser-Tytler. Crown 8vo. Cloth, price 5*s*.

LEE (Rev. F. G.), D.C.L.

The Other World; or, Glimpses of the Supernatural. 2 vols. A New Edition. Crown 8vo. Cloth, price 15*s*.

LEE (Holme).

Her Title of Honour. A Book for Girls. New Edition. With a Frontispiece. Crown 8vo. Cloth, price 5*s*.

LENOIR (J.).

Fayoum; or, Artists in Egypt. A Tour with M. Gérome and others. With 13 Illustrations. A New and Cheaper Edition. Crown 8vo. Cloth, price 3*s*. 6*d*.

LEWIS (Mary A.).

A Rat with Three Tales. With Four Illustrations by Catherine F. Frere. Cloth, price 5*s*.

LISTADO (J. T.).

Civil Service. A Novel. 2 vols. Crown 8vo. Cloth.

LOCKER (F.).

London Lyrics. A New and Revised Edition, with Additions and a Portrait of the Author. Crown 8vo. Cloth, elegant, price 6*s*.

Also, an Edition for the People. Fcap. 8vo. Cloth, price 2*s*. 6*d*.

LOCKYER (J. Norman), F.R.S.

Studies in Spectrum Analysis; with six photographic illustrations of Spectra, and numerous engravings on wood. Crown 8vo. Cloth, price 6*s*. 6*d*.

Vol. XXIII. of the International Scientific Series.

LOMMEL (Dr. E.).

The Nature of Light: With a General Account of Physical Optics. Second Edition. With 188 Illustrations and a Table of Spectra in Chromo-lithography. Crown 8vo. Cloth, price 5*s*.

Volume XVIII. of The International Scientific Series.

LORIMER (Peter), D.D.

John Knox and the Church of England: His Work in her Pulpit, and his Influence upon her Liturgy, Articles, and Parties. Demy 8vo. Cloth, price 12*s*.

LOTHIAN (Roxburghe).

Dante and Beatrice from 1282 to 1290. A Romance. 2 vols. Post 8vo. Cloth, price 24*s*.

LOVEL (Edward).

The Owl's Nest in the City: A Story. Crown 8vo. Cloth, price 10*s*. 6*d*.

LOVER (Samuel), R.H.A.

The Life of Samuel Lover, R. H. A.; Artistic, Literary, and Musical. With Selections from his Unpublished Papers and Correspondence. By Bayle Bernard. 2 vols. With a Portrait. Post 8vo. Cloth, price 21*s*.

LOWER (M. A.), M.A., F.S.A.

Wayside Notes in Scandinavia. Being Notes of Travel in the North of Europe. Crown 8vo. Cloth, price 9*s*.

LUCAS (Alice).

Translations from the Works of German Poets of the 18th and 19th Centuries. Fcap. 8vo. Cloth, price 5*s*.

LYONS (R. T.), Surg.-Maj. Bengal Army.

A Treatise on Relapsing Fever. Post 8vo. Cloth, price 7*s*. 6*d*.

MACAULAY (J.), M.A., M.D., Edin.

The Truth about Ireland: Tours of Observation in 1872 and 1875. With Remarks on Irish Public Questions. Being a Second Edition of "Ireland in 1872," with a New and Supplementary Preface. Crown 8vo. Cloth, price 3*s*. 6*d*.

MAC CLINTOCK (L.).
Sir Spangle and the Dingy Hen. Illustrated. Square crown 8vo., price 2*s*. 6*d*.

MAC DONALD (G.).
Malcolm. With Portrait of the Author engraved on Steel. Crown 8vo. Price 6*s*.

St. George and St. Michael. 3 vols. Crown 8vo. Cloth.

MACLACHLAN (A. N. C.), M.A.
William Augustus, Duke of Cumberland: being a Sketch of his Military Life and Character, chiefly as exhibited in the General Orders of His Royal Highness, 1745—1747. With Illustrations. Post 8vo. Cloth, price 15*s*.

MAC KENNA (S. J.).
Plucky Fellows. A Book for Boys. With Six Illustrations. Second Edition. Crown 8vo. Cloth, price 3*s*. 6*d*.

At School with an Old Dragoon. With Six Illustrations. Second Edition. Crown 8vo. Cloth, price 5*s*.

MAIR (R. S.), M.D., F.R.C.S.E.
The Medical Guide for Anglo-Indians. Being a Compendium of Advice to Europeans in India, relating to the Preservation and Regulation of Health. With a Supplement on the Management of Children in India. Crown 8vo. Limp cloth, price 3*s*. 6*d*.

MALDEN (H. E. and E. E.)
Princes and Princesses. Illustrated. Small crown 8vo. Cloth, price 2*s*. 6*d*.

MANNING (His Eminence Cardinal).
Essays on Religion and Literature. By various Writers. Third Series. Demy 8vo. Cloth, price 10*s*. 6*d*.

The Independence of the Holy See, with an Appendix containing the Papal Allocution and a translation. Crown 8vo. Cloth, price 5*s*.

The True Story of the Vatican Council. Crown 8vo. Cloth, price 5*s*.

MAREY (E. J.).
Animal Mechanics. A Treatise on Terrestrial and Aerial Locomotion. With 117 Illustrations. Second Edition. Crown 8vo. Cloth, price 5*s*.

Volume XI. of The International Scientific Series.

MARRIOTT (Maj.-Gen. W. F.), C.S.I.
A Grammar of Political Economy. Crown 8vo. Cloth, price 6*s*.

MARSHALL (H.).
The Story of Sir Edward's Wife. A Novel. Crown 8vo. Cloth, price 10*s*. 6*d*.

MASTERMAN (J.).
Worth Waiting for. A New Novel. 3 vols. Crown 8vo. Cloth.

Half-a-dozen Daughters. With a Frontispiece. Crown 8vo. Cloth, price 3*s*. 6*d*.

MAUDSLEY (Dr. H.).
Responsibility in Mental Disease. Second Edition. Crown 8vo. Cloth, price 5*s*.

Volume VIII. of The International Scientific Series.

MAUGHAN (W. C.).
The Alps of Arabia; or, Travels through Egypt, Sinai, Arabia, and the Holy Land. With Map. Second Edition. Demy 8vo. Cloth, price 5*s*.

MAURICE (C. E.).
Lives of English Popular Leaders. No. 1.—STEPHEN LANGTON. Crown 8vo. Cloth, price 7*s*. 6*d*. No. 2.—TYLER, BALL, and OLDCASTLE. Crown 8vo. Cloth, price 7*s*. 6*d*.

Mazzini (Joseph).
A Memoir. By E. A. V. Two Photographic Portraits. Second Edition. Crown 8vo. Cloth, price 5*s*.

MEDLEY (Lieut.-Col. J. G.), R.E.
An Autumn Tour in the United States and Canada. Crown 8vo. Cloth, price 5*s*.

MEREDITH (George).
The Ordeal of Richard Feverel. A History of Father and Son. In one vol. with Frontispiece. Crown 8vo. Cloth, price 6*s*.

MICKLETHWAITE (J. T.), F.S.A.
Modern Parish Churches: Their Plan, Design, and Furniture. Crown 8vo. Cloth, price 7*s*. 6*d*.

MILLER (Edward).
The History and Doctrines of Irvingism; or, the so-called Catholic and Apostolic Church. 2 vols. Large post 8vo. Cloth, price 25*s*.

MILNE (James).
Tables of Exchange for the Conversion of Sterling Money into Indian and Ceylon Currency, at Rates from 1*s*. 8*d*. to 2*s*. 3*d*. per Rupee. Second Edition. Demy 8vo. Cloth, price £2 2*s*.

MIRUS (Maj.-Gen. von).
Cavalry Field Duty. Translated by Major Frank S. Russell, 14th (King's) Hussars. Crown 8vo. Cloth limp, price 7*s*. 6*d*.

MIVART (St. George), F.R.S.
Contemporary Evolution: An Essay on some recent Social Changes. Post 8vo. Cloth, price 7*s*. 6*d*.

MOCKLER (E.).
A Grammar of the Baloochee Language, as it is spoken in Makran (Ancient Gedrosia), in the Persia-Arabic and Roman characters. Fcap. 8vo. Cloth, price 5*s*.

MOFFAT (Robert Scott).
The Economy of Consumption; an Omitted Chapter in Political Economy, with special reference to the Questions of Commercial Crises and the Policy of Trades Unions; and with Reviews of the Theories of Adam Smith, Ricardo, J. S. Mill, Fawcett, &c. Demy 8vo. Cloth, price 18*s*.

MOLTKE (Field-Marshal Von).
Letters from Russia. Translated by Robina Napier. Crown 8vo. Cloth, price 6*s*.

MOORE (Rev. D.), M.A.
Christ and His Church. By the Author of "The Age and the Gospel," &c. Crown 8vo. Cloth, price 3*s*. 6*d*.

MORE (R. Jasper).
Under the Balkans. Notes of a Visit to the District of Philippopolis in 1876. With a Map and Illustrations from Photographs. Crown 8vo. Cloth, price 6*s*.

MORELL (J. R.).
Euclid Simplified in Method and Language. Being a Manual of Geometry. Compiled from the most important French Works, approved by the University of Paris and the Minister of Public Instruction. Fcap. 8vo. Cloth, price 2*s*. 6*d*.

MORICE (Rev. F. D.), M.A.
The Olympian and Pythian Odes of Pindar. A New Translation in English Verse. Crown 8vo. Cloth, price 7*s*. 6*d*.

MORLEY (Susan).
Aileen Ferrers. A Novel. 2 vols. Crown 8vo. Cloth.

Throstlethwaite. A Novel. 3 vols. Crown 8vo. Cloth.

Margaret Chetwynd. A Novel. 3 vols. Crown 8vo. Cloth, price 31*s*. 6*d*.

MORSE (E. S.), Ph.D.
First Book of Zoology. With numerous Illustrations. Crown 8vo. Cloth, price 5*s*.

MORSHEAD (E. D. A.)
The Agamemnon of Æschylus. Translated into English verse. With an Introductory Essay. Crown 8vo. Cloth, price 5*s*.

MOSTYN (Sydney).
Perplexity. A Novel. 3 vols. Crown 8vo. Cloth.

MUSGRAVE (Anthony).
Studies in Political Economy. Crown 8vo. Cloth, price 6*s*.

My Sister Rosalind. A Novel. By the Author of "Christiana North," and "Under the Limes." 2 vols. Cloth.

NAAKÉ (J. T.).
Slavonic Fairy Tales. From Russian, Servian, Polish, and Bohemian Sources. With Four Illustrations. Crown 8vo. Cloth, price 5*s*.

NEWMAN (J. H.), D.D.
Characteristics from the Writings of. Being Selections from his various Works. Arranged with the Author's personal approval. Third Edition. With Portrait. Crown 8vo. Cloth, price 6*s*.
*** A Portrait of the Rev. Dr. J. H. Newman, mounted for framing, can be had, price 2*s*. 6*d*.

NEW WRITER (A).
Songs of Two Worlds. By a New Writer. Third Series. Second Edition. Fcap. 8vo. Cloth, price 5*s*.

The Epic of Hades. Fourth and finally revised Edition. Fcap. 8vo. Cloth, price 7*s*. 6*d*.

NICHOLAS (Thomas), Ph. D., F.G.S.
The Pedigree of the English People: an Argument, Historical and Scientific, on the Formation and Growth of the Nation, tracing Race-admixture in Britain from the earliest times, with especial reference to the incorporation of the Celtic Aborigines. Fifth edition. Demy 8vo. Cloth, price 16*s*.

NICHOLSON (Edward B.), Librarian of the London Institution.
The Christ Child, and other Poems. Crown 8vo. Cloth, price 4*s*. 6*d*.

NOAKE (Major R. Compton).
The Bivouac; or, Martial Lyrist, with an Appendix—Advice to the Soldier. Fcap. 8vo. Price 5*s*. 6*d*.

NOBLE (J. A.).
The Pelican Papers. Reminiscences and Remains of a Dweller in the Wilderness. Crown 8vo. Cloth, price 6*s*.

NORMAN PEOPLE (The).
The Norman People, and their Existing Descendants in the British Dominions and the United States of America. Demy 8vo. Cloth, price 21*s*.

NORRIS (Rev. Alfred).
The Inner and Outer Life Poems. Fcap. 8vo. Cloth, price 6*s*.

Northern Question (The); Or, Russia's Policy in Turkey unmasked. Demy 8vo. Sewed, price 1*s*.

Notes on Cavalry Tactics, Organization, &c. By a Cavalry Officer. With Diagrams. Demy 8vo. Cloth, price 12*s*.

NOTREGE (John), A.M.
The Spiritual Function of a Presbyter in the Church of England. Crown 8vo. Cloth, red edges, price 3*s*. 6*d*.

Oriental Sporting Magazine (The).
A Reprint of the first 5 Volumes, in 2 Volumes. Demy 8vo. Cloth, price 28*s*.

Our Increasing Military Difficulty, and one Way of Meeting it. Demy 8vo. Stitched, price 1*s*.

PAGE (Capt. S. F.).
Discipline and Drill. Cheaper Edition. Crown 8vo. Price 1*s*.

PALGRAVE, (W. Gifford).
Hermann Agha; An Eastern Narrative. Third and Cheaper Edition. Crown 8vo. Cloth, price 6*s*.

PANDURANG HARI;
Or, Memoirs of a Hindoo. With an Introductory Preface by Sir H. Bartle E. Frere, G.C.S.I., C.B. Crown 8vo. Price 6*s*.

PARKER (Joseph), D.D.
The Paraclete: An Essay on the Personality and Ministry of the Holy Ghost, with some reference to current discussions. Second Edition. Demy 8vo. Cloth, price 12*s*.

PARR (Harriet).
Echoes of a Famous Year. Crown 8vo. Cloth, price 8*s*. 6*d*.

PAUL (C. Kegan).
Goethe's Faust. A New Translation in Rime. Crown 8vo. Cloth, price 6*s*.

William Godwin: His Friends and Contemporaries. With Portraits and Facsimiles of the Handwriting of Godwin and his Wife. 2 vols. Square post 8vo. Cloth, price 28*s*.

The Genius of Christianity Unveiled. Being Essays by William Godwin never before published. Edited, with a Preface, by C. Kegan Paul. Crown 8vo. Cloth, price 7*s*. 6*d*.

PAUL (Margaret Agnes).

Gentle and Simple: A Story. 2 vols. Crown 8vo. Cloth, gilt tops, price 12*s.*

PAYNE (John).

Songs of Life and Death. Crown 8vo Cloth, price 5*s.*

PAYNE (Prof. J. F.).

Lectures on Education. Price 6*d.* each.

I. Pestalozzi: the Influence of His Principles and Practice.

II. Fröbel and the Kindergarten System. Second Edition.

III. The Science and Art of Education.

IV. The True Foundation of Science Teaching.

A Visit to German Schools: Elementary Schools in Germany. Notes of a Professional Tour to inspect some of the Kindergartens, Primary Schools, Public Girls Schools, and Schools for Technical Instruction in Hamburgh, Berlin, Dresden, Weimar, Gotha, Eisenach, in the autumn of 1874. With Critical Discussions of the General Principles and Practice of Kindergartens and other Schemes of Elementary Education. Crown 8vo. Cloth, price 4*s.* 6*d.*

PEACOCKE (Georgiana).

Rays from the Southern Cross: Poems. Crown 8vo. With Sixteen Full-page Illustrations by the Rev. P. Walsh. Cloth elegant, price 10*s.* 6*d.*

PELLETAN (E.).

The Desert Pastor, Jean Jarousseau. Translated from the French. By Colonel E. P. De L'Hoste. With a Frontispiece. New Edition. Fcap. 8vo. Cloth, price 3*s.* 6*d.*

PENNELL (H. Cholmondeley).

Pegasus Resaddled. By the Author of "Puck on Pegasus," &c. &c. With Ten Full-page Illustrations by George Du Maurier. Second Edition. Fcap. 4to. Cloth elegant, price 12*s.* 6*d.*

PENRICE (Maj. J.), B.A.

A Dictionary and Glossary of the Ko-ran. With copious Grammatical References and Explanations of the Text. 4to. Cloth, price 21*s.*

PERCIVAL (Rev. P.).

Tamil Proverbs, with their English Translation. Containing upwards of Six Thousand Proverbs. Third Edition. Demy 8vo. Sewed, price 9*s.*

PERRY (Rev. S. J.), F.R.S.

Notes of a Voyage to Kerguelen Island, to observe the Transit of Venus. Demy 8vo. Sewed, price 2*s.*

PESCHEL (Dr. Oscar).

The Races of Man and their Geographical Distribution. Large crown 8vo. Cloth, price 9*s.*

PETTIGREW (J. Bell), M.D. F.R.S.

Animal Locomotion; or, Walking, Swimming, and Flying. With 130 Illustrations. Second Edition. Crown 8vo. Cloth, price 5*s.*

Volume VII. of The International Scientific Series.

PFEIFFER (Emily).

Glan Alarch: His Silence and Song. A Poem. Crown 8vo. price 6*s.*

Gerard's Monument and Other Poems. Second Edition. Crown 8vo. Cloth, price 6*s.*

PIGGOT (J.), F.S.A., F.R.G.S.

Persia—Ancient and Modern. Post 8vo. Cloth, price 10*s.* 6*d.*

PLAYFAIR (Lieut.-Col.), Her Britannic Majesty's Consul-General in Algiers.

Travels in the Footsteps of Bruce in Algeria and Tunis. Illustrated by facsimiles of Bruce's original Drawings, Photographs, Maps, &c. Royal 4to. Cloth, bevelled boards, gilt leaves, price £3 3*s.*

POOR (Henry V.).

Money and its Laws, embracing a History of Monetary Theories and a History of the Currencies of the United States. Demy 8vo. Cloth, price 21*s*.

POUSHKIN (A. S.).

Russian Romance. Translated from the Tales of Belkin, etc. By Mrs. J. Buchan Telfer (*née* Mouravieff). Crown 8vo. Cloth, price 7*s*. 6*d*.

POWER (H.).

Our Invalids: How shall we Employ and Amuse Them? Fcap. 8vo. Cloth, price 2*s*. 6*d*.

POWLETT (Lieut. N.), R.A.

Eastern Legends and Stories in English Verse. Crown 8vo. Cloth, price 5*s*.

PRESBYTER.

Unfoldings of Christian Hope. An Essay showing that the Doctrine contained in the Damnatory Clauses of the Creed commonly called Athanasian is unscriptural. Small crown 8vo. Cloth, price 4*s*. 6*d*.

PRICE (Prof. Bonamy).

Currency and Banking. Crown 8vo. Cloth, price 6*s*.

PROCTOR (Richard A.), B.A.

Our Place among Infinities. A Series of Essays contrasting our little abode in space and time with the Infinities around us. To which are added Essays on "Astrology," and "The Jewish Sabbath." Third Edition. Crown 8vo. Cloth, price 6*s*.

The Expanse of Heaven. A Series of Essays on the Wonders of the Firmament. With a Frontispiece Third Edition. Crown 8vo. Cloth, price 6*s*.

PUBLIC SCHOOLBOY.

The Volunteer, the Militiaman, and the Regular Soldier. Crown 8vo. Cloth, price 5*s*.

REANEY (Mrs. G. S.).

Blessing and Blessed; a Sketch of Girl Life. With a frontispiece. Crown 8vo. Cloth, price 5*s*.

Waking and Working; or, from Girlhood to Womanhood. With a Frontispiece. Crown 8vo. Cloth, price 5*s*.

Sunshine Jenny and other Stories. Three Illustrations. Royal 16mo. Cloth, price 1*s*. 6*d*.

Sunbeam Willie, and other Stories. Three Illustrations. Royal 16mo. Cloth, price 1*s*. 6*d*.

Reginald Bramble.

A Cynic of the Nineteenth Century. An Autobiography. Crown 8vo. Cloth, price 10*s*. 6*d*.

RHOADES (James).

Timoleon. A Dramatic Poem. Fcap. 8vo. Cloth, price 5*s*.

RIBOT (Prof. Th.).

English Psychology. Second Edition. A Revised and Corrected Translation from the latest French Edition. Large post 8vo. Cloth, price 9*s*.

Heredity: A Psychological Study on its Phenomena, its Laws, its Causes, and its Consequences. Large crown 8vo. Cloth, price 9*s*.

RINK (Chevalier Dr. Henry).

Greenland: Its People and its Products. By the Chevalier Dr. Henry Rink, President of the Greenland Board of Trade. With sixteen Illustrations, drawn by the Eskimo, and a Map. Edited by Dr. Robert Brown. Crown 8vo. Price 10*s*. 6*d*.

ROBERTSON (The Late Rev. F. W.), M.A., of Brighton.

Notes on Genesis. Third Edition. Crown 8vo., price 5*s*.

New and Cheaper Editions:—

The Late Rev. F. W. Robertson, M.A., Life and Letters of. Edited by the Rev. Stopford Brooke, M.A., Chaplain in Ordinary to the Queen.

ROBERTSON (The Late Rev. F. W.), M.A.—*continued.*

I. 2 vols., uniform with the Sermons. With Steel Portrait. Crown 8vo. Cloth, price 7*s.* 6*d.*

II. Library Edition, in Demy 8vo., with Two Steel Portraits. Cloth price 12*s.*

III. A Popular Edition, in 1 vol. Crown 8vo. Cloth, price 6*s.*

Sermons. Four Series. Small crown 8vo. Cloth, price 3*s.* 6*d.* each.

Expository Lectures on St. Paul's Epistles to the Corinthians. A New Edition. Small crown 8vo. Cloth, price 5*s.*

Lectures and Addresses, with other literary remains. A New Edition. Crown 8vo. Cloth, price 5*s.*

An Analysis of Mr. Tennyson's "In Memoriam." (Dedicated by Permission to the Poet-Laureate.) Fcap. 8vo. Cloth, price 2*s.*

The Education of the Human Race. Translated from the German of Gotthold Ephraim Lessing. Fcap. 8vo. Cloth, price 2*s.* 6*d.*

The above Works can also be had bound in half-morocco.

*** A Portrait of the late Rev. F. W. Robertson, mounted for framing, can be had, price 2*s.* 6*d.*

ROSS (Mrs. E.), ("Nelsie Brook").

Daddy's Pet. A Sketch from Humble Life. With Six Illustrations. Royal 16mo. Cloth, price 1*s.*

RUSSELL (E. R.).

Irving as Hamlet. Second Edition. Demy 8vo. Sewed, price 1*s.*

RUSSELL (Major Frank S.).

Russian Wars with Turkey, Past and Present. With Two Maps. Second Edition. Crown 8vo., price 6*s.*

RUTHERFORD (John).

The Secret History of the Fenian Conspiracy; its Origin, Objects, and Ramifications. 2 vols. Post 8vo. Cloth, price 18*s.*

SADLER (S. W.), R.N.

The African Cruiser. A Midshipman's Adventures on the West Coast. With Three Illustrations. Second Edition. Crown 8vo. Cloth, price 3*s.* 6*d.*

SAMAROW (G.).

For Sceptre and Crown. A Romance of the Present Time. Translated by Fanny Wormald. 2 vols. Crown 8vo. Cloth, price 15*s.*

SAUNDERS (Katherine).

The High Mills. A Novel. 3 vols. Crown 8vo. Cloth.

Gideon's Rock, and other Stories. Crown 8vo. Cloth, price 6*s.*

Joan Merryweather, and other Stories. Crown 8vo. Cloth, price 6*s.*

Margaret and Elizabeth. A Story of the Sea. Crown 8vo. Cloth, price 6*s.*

SAUNDERS (John).

Israel Mort, Overman: a Story of the Mine. Crown 8vo. Price 6*s.*

Hirell. With Frontispiece. Crown 8vo. Cloth, price 3*s.* 6*d.*

Cheap Edition. With Frontispiece, price 2*s.*

Abel Drake's Wife. With Frontispiece. Crown 8vo. Cloth, price 3*s.* 6*d.*

Cheap Edition. With Frontispiece, price 2*s.*

SCHELL (Maj. von).

The Operations of the First Army under Gen. Von Goeben. Translated by Col. C. H. von Wright. Four Maps. Demy 8vo. Cloth, price 9*s.*

The Operations of the First Army under Gen. Von Steinmetz. Translated by Captain E. O. Hollist. Demy 8vo. Cloth, price 10*s.* 6*d.*

SCHELLENDORF, (Maj.-Gen. B. von).

The Duties of the General Staff. Translated from the German by Lieutenant Hare. Vol. I. Demy 8vo. Cloth, 10*s.* 6*d.*

SCHERFF (Maj. W. von).

Studies in the New Infantry Tactics. Parts I. and II. Translated from the German by Colonel Lumley Graham. Demy 8vo. Cloth, price 7*s.* 6*d.*

SCHMIDT (Prof. Oscar).

The Doctrine of Descent and Darwinism. With 26 Illustrations. Third Edition. Crown 8vo. Cloth, price 5*s.*

Volume XII. of The International Scientific Series.

SCHÜTZENBERGER (Prof. F.).

Fermentation. With Numerous Illustrations. Crown 8vo. Cloth, price 5*s.*

Volume XX. of The International Scientific Series.

SCOTT (Patrick).

The Dream and the Deed, and other Poems. Fcap. 8vo. Cloth, price 5*s.*

SCOTT (W. T.).

Antiquities of an Essex Parish; or, Pages from the History of Great Dunmow. Crown 8vo. Cloth, price 5*s.* Sewed, 4*s.*

SCOTT (Robert H.).

Weather Charts and Storm Warnings. Illustrated. Crown 8vo. Cloth, price 3*s.* 6*d.*

Seeking his Fortune, and other Stories. With Four Illustrations. Crown 8vo. Cloth, price 3*s.* 6*d.*

SENIOR (N. W.).

Alexis De Tocqueville. Correspondence and Conversations with Nassau W. Senior, from 1833 to 1859. Edited by M. C. M. Simpson. 2 vols. Large post 8vo. Cloth, price 21*s.*

Journals Kept in France and Italy. From 1848 to 1852. With a Sketch of the Revolution of 1848. Edited by his Daughter, M. C. M. Simpson. 2 vols. Post 8vo. Cloth, price 24*s.*

Seven Autumn Leaves from Fairyland. Illustrated with Nine Etchings. Square crown 8vo. Cloth, price 3*s.* 6*d.*

SEYD (Ernest), F.S.S.

The Fall in the Price of Silver. Its Causes, its Consequences, and their Possible Avoidance, with Special Reference to India. Demy 8vo. Sewed, price 2*s.* 6*d.*

SHADWELL (Maj.-Gen.), C.B.

Mountain Warfare. Illustrated by the Campaign of 1799 in Switzerland. Being a Translation of the Swiss Narrative compiled from the Works of the Archduke Charles, Jomini, and others. Also of Notes by General H. Dufour on the Campaign of the Valtelline in 1635. With Appendix, Maps, and Introductory Remarks. Demy 8vo. Cloth, price 16*s.*

SHAW (Flora L.).

Castle Blair: a Story of Youthful Lives. 2 vols. crown 8vo. Cloth, price 12*s.*

SHELDON (Philip).

Woman's a Riddle; or, Baby Warmstrey. A Novel. 3 vols. Crown 8vo. Cloth.

SHELLEY (Lady).

Shelley Memorials from Authentic Sources. With (now first printed) an Essay on Christianity by Percy Bysshe Shelley. With Portrait. Third Edition. Crown 8vo. Cloth, price 5*s.*

SHERMAN (Gen. W. T.).

Memoirs of General W. T. Sherman, Commander of the Federal Forces in the American Civil War. By Himself. 2 vols. With Map. Demy 8vo Cloth, price 24*s.* *Copyright English Edition.*

SHILLITO (Rev. Joseph).

Womanhood: its Duties, Temptations, and Privileges. A Book for Young Women. Crown 8vo. Price 3*s.* 6*d.*

SHIPLEY (Rev. Orby), M.A.

Church Tracts, or Studies in Modern Problems. By various Writers. 2 vols. Crown 8vo. Cloth, price 5*s.* each.

SHUTE (Richard), M.A.

A Discourse on Truth. Post 8vo. Cloth, price 9*s.*

SMEDLEY (M. B.).

Boarding-out and Pauper Schools for Girls. Crown 8vo. Cloth, price 3*s.* 6*d.*

SMITH (Edward), M.D., LL.B., F.R.S.

Health and Disease, as Influenced by the Daily, Seasonal, and other Cyclical Changes in the Human System. A New Edition. Post 8vo. Cloth, price 7*s.* 6*d.*

Foods. Profusely Illustrated. Fourth Edition. Crown 8vo. Cloth, price 5*s.*

Volume III. of The International Scientific Series.

Practical Dietary for Families, Schools, and the Labouring Classes. A New Edition. Post 8vo. Cloth, price 3*s.* 6*d.*

Tubercular Consumption in its Early and Remediable Stages. Second Edition. Crown 8vo. Cloth, price 6*s.*

SMITH (Hubert).

Tent Life with English Gipsies in Norway. With Five full-page Engravings and Thirty-one smaller Illustrations by Whymper and others, and Map of the Country showing Routes. Third Edition. Revised and Corrected. Post 8vo. Cloth, price 21*s.*

Some Time in Ireland.

A Recollection. Crown 8vo. Cloth, price 7*s.* 6*d.*

Songs for Music.

By Four Friends. Square crown 8vo. Cloth, price 5*s.*

Containing songs by Reginald A. Gatty, Stephen H. Gatty, Greville J. Chester, and Juliana Ewing.

SPENCER (Herbert).

The Study of Sociology. Fifth Edition. Crown 8vo. Cloth, price 5*s.*

Volume V. of The International Scientific Series.

SPICER (H.).

Otho's Death Wager. A Dark Page of History Illustrated. In Five Acts. Fcap. 8vo. Cloth, price 5*s.*

STEPHENS (Archibald John), LL.D., on behalf of the Respondents in "Ridsdale *v.* Clifton and others."

The Folkestone Ritual Case. The Substance of the Argument delivered before the Judicial Committee of the Privy Council. Demy 8vo. Cloth, price 6*s.*

STEVENSON (Rev. W. F.).

Hymns for the Church and Home. Selected and Edited by the Rev. W. Fleming Stevenson.

The most complete Hymn Book published.

The Hymn Book consists of Three Parts :—I. For Public Worship.—II. For Family and Private Worship.—III. For Children.

*** *Published in various forms and prices, the latter ranging from* 8*d.* *to* 6*s.* *Lists and full particulars will be furnished on application to the Publishers.*

STEWART (Prof. Balfour), M.A., LL.D., F.R.S.

On the Conservation of Energy. Third Edition. With Fourteen Engravings. Crown 8vo. Cloth, price 5*s.*

Volume VI. of The International Scientific Series.

STONEHEWER (Agnes).

Monacella: A Legend of North Wales. A Poem. Fcap. 8vo. Cloth, price 3*s.* 6*d.*

STRETTON (Hesba). Author of "Jessica's First Prayer."

Michael Lorio's Cross and other Stories. With Two Illustrations. Royal 16mo. Cloth, price 1*s.* 6*d.*

The Storm of Life. With Ten Illustrations. Sixteenth Thousand. Royal 16mo. Cloth, price 1*s.* 6*d.*

The Crew of the Dolphin. Illustrated. Twelfth Thousand. Royal 16mo. Cloth, price 1*s.* 6*d.*

Cassy. Thirty-second Thousand. With Six Illustrations. Royal 16mo. Cloth, price 1*s.* 6*d.*

The King's Servants. Thirty-eighth Thousand. With Eight Illustrations. Royal 16mo. Cloth, price 1*s.* 6*d*

STRETTON (Hesba)—*continued.*

Lost Gip. Fifty-second Thousand. With Six Illustrations. Royal 16mo. Cloth, price 1*s.* 6*d.*

*** *Also a handsomely bound Edition, with Twelve Illustrations, price* 2*s.* 6*d.*

David Lloyd's Last Will. With Four Illustrations. Royal 16mo., price 2*s.* 6*d.*

The Wonderful Life. Eleventh Thousand. Fcap. 8vo. Cloth, price 2*s.* 6*d.*

A Night and a Day. With Frontispiece. Eighth Thousand. Royal 16mo. Limp cloth, price 6*d.*

Friends till Death. With Illustrations and Frontispiece. Twentieth Thousand. Royal 16mo. Cloth, price 1*s.* 6*d.*; limp cloth, price 6*d.*

Two Christmas Stories. With Frontispiece. Fifteenth Thousand. Royal 16mo. Limp cloth, price 6*d.*

Michel Lorio's Cross, and Left Alone. With Frontispiece. Twelfth Thousand. Royal 16mo. Limp cloth, price 6*d.*

Old Transome. With Frontispiece. Twelfth Thousand. Royal 16mo. Limp cloth, price 6*d.*

*** Taken from "The King's Servants."

The Worth of a Baby, and how Apple-Tree Court was won. With Frontispiece. Fifteenth Thousand. Royal 16mo. Limp cloth, price 6*d.*

Hester Morley's Promise. 3 vols. Crown 8vo. Cloth.

The Doctor's Dilemma. 3 vols. Crown 8vo. Cloth.

STUBBS (Lieut.-Colonel F. W.)

The Regiment of Bengal Artillery. The History of its Organization, Equipment, and War Services. Compiled from Published Works, Official Records, and various Private Sources. With numerous Maps and Illustrations. Two Vols. Demy 8vo. Cloth, price 32*s.*

STUMM (Lieut. Hugo), German Military Attaché to the Khivan Expedition.

Russia's advance Eastward. Based on the Official Reports of. Translated by Capt. C. E. H. Vincent. With Map. Crown 8vo. Cloth, price 6*s.*

SULLY (James), M.A.

Sensation and Intuition. Demy 8vo. Cloth, price 10*s.* 6*d.*

Pessimism: a History and a Criticism. Demy 8vo. Price 14*s.*

Sunnyland Stories. By the Author of "Aunt Mary's Bran Pie." Illustrated. Small 8vo. Cloth, price 3*s.* 6*d.*

Supernatural in Nature, The. A Verification of Scripture by Free Use of Science. Demy 8vo. Cloth, price 14*s.*

Sweet Silvery Sayings of Shakespeare. Crown 8vo. cloth gilt, price 7*s.* 6*d.*

SYME (David).

Outlines of an Industrial Science. Second Edition. Crown 8vo. Cloth, price 6*s.*

Tales of the Zenana. By the Author of "Pandurang Hari." 2 vols. Crown 8vo. Cloth, price 21*s.*

TAYLOR (Rev. J. W. A.), M.A.

Poems. Fcap. 8vo. Cloth, price 5*s.*

TAYLOR (Sir H.).

Works Complete. Author's Edition, in 5 vols. Crown 8vo. Cloth, price 6*s.* each.

Vols. I. to III. containing the Poetical Works, Vols. IV. and V. the Prose Works.

TAYLOR (Col. Meadows), C.S.I., M.R.I.A.

A Noble Queen: a Romance of Indian History. 3 vols. Crown 8vo. cloth.

The Confessions of a Thug. Crown 8vo. Cloth, price 6*s.*

Tara: a Mahratta Tale. Crown 8vo. Cloth, price 6*s.*

TELFER (J. Buchan), F.R.G.S., Commander R.N.

The Crimea and Trans-Caucasia. With numerous Illustrations and Maps. 2 vols. Medium 8vo. Second Edition. Cloth, price 36*s*.

TENNYSON (Alfred).

The Imperial Library Edition. Complete in 7 vols. Demy 8vo. Cloth, price £3 13*s*. 6*d*.; in Roxburgh binding, £4 7*s*. 6*d*.

Author's Edition. Complete in 6 Volumes. Post 8vo. Cloth gilt; or half-morocco, Roxburgh style:—

Vol. I. Early Poems, and English Idylls. Price 6*s*.; Roxburgh, 7*s*. 6*d*.

Vol. II. Locksley Hall, Lucretius, and other Poems. Price 6*s*.; Roxburgh, 7*s*. 6*d*.

Vol. III. The Idylls of the King (*Complete*). Price 7*s*. 6*d*.; Roxburgh, 9*s*.

Vol. IV. The Princess, and Maud. Price 6*s*.; Roxburgh, 7*s*. 6*d*.

Vol. V. Enoch Arden, and In Memoriam. Price 6*s*.; Roxburgh, 7*s*. 6*d*.

Vol. VI. Dramas. Price 7*s*.; Roxburgh, 8*s*. 6*d*.

Cabinet Edition. 12 volumes. Each with Frontispiece. Fcap. 8vo. Cloth, price 2*s*. 6*d*. each.

Cabinet Edition. 12 vols. Complete in handsome Ornamental Case. 32*s*.

Pocket Volume Edition. 13 vols. In neat case, 36*s*. Ditto, ditto. Extra cloth gilt, in case, 42*s*.

The Shilling Edition of the Poetical and Dramatic Works, in 12 vols., pocket size. Price 1*s*. each.

TENNYSON (Alfred)—*continued.*

Original Editions:

Poems. Small 8vo. Cloth, price 6*s*.

Maud, and other Poems. Small 8vo. Cloth price 3*s*. 6*d*

The Princess. Small 8vo. Cloth, price 3*s*. 6*d*.

Idylls of the King. Small 8vo. Cloth, price 5*s*.

Idylls of the King. Complete. Small 8vo. Cloth, price 6*s*.

The Holy Grail, and other Poems. Small 8vo. Cloth, price 4*s*. 6*d*.

Gareth and Lynette. Small 8vo. Cloth, price 3*s*.

Enoch Arden, &c. Small 8vo. Cloth, price 3*s*. 6*d*.

In Memoriam. Small 8vo. Cloth, price 4*s*.

Queen Mary. A Drama. New Edition. Crown 8vo. Cloth, price 6*s*.

Harold. A Drama. Crown 8vo. Cloth, price 6*s*.

Selections from Tennyson's Works. Super royal 16mo. Cloth, price 3*s*. 6*d*. Cloth gilt extra, price 4*s*.

Songs from Tennyson's Works. Super royal 16mo. Cloth extra, price 3*s*. 6*d*.

Also a cheap edition. 16mo. Cloth, price 2*s*. 6*d*.

Idylls of the King, and other Poems. Illustrated by Julia Margaret Cameron. 2 vols. Folio. Half-bound morocco, cloth sides, price £6 6*s*. each.

Tennyson for the Young and for Recitation. Specially arranged. Fcap. 8vo. Price 1*s*. 6*d*.

Tennyson Birthday Book. Edited by Emily Shakespear. 32mo. Cloth limp, 2*s*.; cloth extra, 3*s*.

THOMAS (Moy).
A Fight for Life. With Frontispiece. Crown 8vo. Cloth, price 3*s*. 6*d*.

Thomasina.
A Novel. 2 vols. Crown 8vo. Cloth.

THOMPSON (Alice C.).
Preludes. A Volume of Poems. Illustrated by Elizabeth Thompson (Painter of "The Roll Call"). 8vo. Cloth, price 7*s*. 6*d*.

THOMPSON (Rev. A. S.).
Home Words for Wanderers. A Volume of Sermons. Crown 8vo. Cloth, price 6*s*.

Thoughts in Verse.
Small Crown 8vo. Cloth, price 1*s*. 6*d*.

THRING (Rev. Godfrey), B.A.
Hymns and Sacred Lyrics. Fcap. 8vo. Cloth, price 5*s*.

TODD (Herbert), M.A.
Arvan; or, The Story of the Sword. A Poem. Crown 8vo. Cloth, price 7*s*. 6*d*.

TODHUNTER (Dr. J.)
Laurella; and other Poems. Crown 8vo. Cloth, price 6*s*. 6*d*.

TRAHERNE (Mrs. A.).
The Romantic Annals of a Naval Family. A New and Cheaper Edition. Crown 8vo. Cloth, price 5*s*.

TRAVERS (Mar.).
The Spinsters of Blatchington. A Novel. 2 vols. Crown 8vo. Cloth.

Waiting for Tidings. By the Author of "White and Black." 3 vols. crown 8vo.

TREMENHEERE (Lieut.-Gen. C. W.)
Missions in India: the System of Education in Government and Mission Schools contrasted. Demy 8vo. Sewed, price 2*s*.

TURNER (Rev. C. Tennyson).
Sonnets, Lyrics, and Translations. Crown 8vo. Cloth, price 4*s*. 6*d*.

TYNDALL (John), L.L.D., F.R.S.
The Forms of Water in Clouds and Rivers, Ice and Glaciers. With Twenty-five Illustrations. Sixth Edition. Crown 8vo. Cloth, price 5*s*.
Volume I. of The International Scientific Series.

UMBRA OXONIENSIS.
Results of the expostulation of the Right Honourable W. E. Gladstone, in their Relation to the Unity of Roman Catholicism. Large fcap. 8vo. Cloth, price 5*s*.

VAMBERY (Prof. A.).
Bokhara: Its History and Conquest. Second Edition. Demy 8vo. Cloth, price 18*s*.

VAN BENEDEN (Mons.).
Animal Parasites and Messmates. With 83 Illustrations. Second Edition. Cloth, price 5*s*.
Volume XIX. of The International Scientific Series.

VANESSA.
By the Author of "Thomasina," &c. A Novel. 2 vols. Second Edition. Crown 8vo. Cloth.

VINCENT (Capt. C. E. H.).
Elementary Military Geography, Reconnoitring, and Sketching. Compiled for Non-Commissioned Officers and Soldiers of all Arms. Square crown 8vo. Cloth, price 2*s*. 6*d*.

VOGEL (Dr. Hermann).
The Chemical effects of Light and Photography, in their application to Art, Science, and Industry. The translation thoroughly revised. With 100 Illustrations, including some beautiful specimens of Photography. Third Edition. Crown 8vo. Cloth, price 5*s*.
Volume XV. of The International Scientific Series.

VYNER (Lady Mary).
Every day a Portion. Adapted from the Bible and the Prayer Book, for the Private Devotions of those living in Widowhood. Collected and edited by Lady Mary Vyner. Square crown 8vo. Cloth extra, price 5*s*.

Waiting for Tidings.
By the Author of "White and Black." 3 vols. Crown 8vo. Cloth.

WARTENSLEBEN (Count H. von).

The Operations of the South Army in January and February, 1871. Compiled from the Official War Documents of the Head-quarters of the Southern Army. Translated by Colonel C. H. von Wright. With Maps. Demy 8vo. Cloth, price 6*s*.

The Operations of the First Army under Gen. von Manteuffel. Translated by Colonel C. H. von Wright. Uniform with the above. Demy 8vo. Cloth, price 9*s*.

WATERFIELD, W.

Hymns for Holy Days and Seasons. 32mo. Cloth, price 1*s*. 6*d*.

WAY (A.), M.A.

The Odes of Horace Literally Translated in Metre. Fcap. 8vo. Cloth, price 2*s*.

WEDMORE (F.).

Two Girls. 2 vols. Crown 8vo. Cloth.

WELLS (Capt. John C.), R.N.

Spitzbergen—The Gateway to the Polynia; or, A Voyage to Spitzbergen. With numerous Illustrations by Whymper and others, and Map. New and Cheaper Edition. Demy 8vo. Cloth, price 6*s*.

WETMORE (W. S.).

Commercial Telegraphic Code. Second Edition. Post 4to. Boards, price 42*s*.

What 'tis to Love.
By the Author of "Flora Adair," "The Value of Fosterstown." 3 vols. Crown 8vo. Cloth.

WHITAKER (Florence).

Christy's Inheritance. A London Story. Illustrated. Royal 16mo. Cloth, price 1*s*. 6*d*.

WHITE (A. D.), LL.D.

Warfare of Science. With Prefatory Note by Professor Tyndall. Second Edition. Crown 8vo. Cloth, price 3*s*. 6*d*.

WHITE (Capt. F. B. P.).

The Substantive Seniority Army List—Majors and Captains. 8vo. Sewed, price 2*s*. 6*d*.

WHITNEY (Prof. W. D.), of Yale College, New Haven.

The Life and Growth of Language. Second Edition. Crown 8vo. Cloth, price 5*s*. *Copyright Edition.*

Volume XVI. of The International Scientific Series.

WHITNEY (Prof. W. D.), of Yale College, New Haven—*continued.*

Essentials of English Grammar for the Use of Schools. Crown 8vo. Cloth, price 3*s*. 6*d*.

WHITTLE (J. L.), A.M.

Catholicism and the Vatican. With a Narrative of the Old Catholic Congress at Munich. Second Edition. Crown 8vo. Cloth, price 4*s*. 6*d*.

WICKHAM (Capt. E. H., R.A.)

Influence of Firearms upon Tactics: Historical and Critical Investigations. By an Officer of Superior Rank (in the German Army). Translated by Captain E. H. Wickham, R.A. Demy 8vo. Cloth, price 7*s*. 6*d*.

WILBERFORCE (H. W.).

The Church and the Empires. Historical Periods. Preceded by a Memoir of the Author by John Henry Newman, D.D. of the Oratory. With Portrait. Post 8vo. Cloth, price 10*s*. 6*d*.

WILKINSON (T. L.).

Short Lectures on the Land Laws. Delivered before the Working Men's College. Crown 8vo. Limp Cloth, price 2*s*.

WILLIAMS (A. Lukyn).

Famines in India; their Causes and Possible Prevention. The Essay for the Le Bas Prize, 1875. Demy 8vo. Cloth, price 5*s*.

WILLIAMS (Charles), one of the Special Correspondents attached to the Staff of Ghazi Ahmed Mouktar Pasha.

The Armenian Campaign: Diary of the Campaign of 1877 in Armenia and Koordistan. With Two Special Maps. Large post 8vo. Cloth, price 10*s*. 6*d*.

WILLIAMS (Rowland), D.D.

Life and Letters of, with Extracts from his Note-Books. Edited by Mrs. Rowland Williams. With a Photographic Portrait. 2 vols. Large post 8vo. Cloth, price 24*s*.

Psalms, Litanies, Counsels and Collects for Devout Persons. Edited by his Widow. New and Popular Edition. Crown 8vo. Cloth, price 3*s*. 6*d*.

WILLIS (R., M.D.)

Servetus and Calvin: a Study of an Important Epoch in the Early History of the Reformation. 8vo. Cloth, price 16*s*.

WILLOUGHBY (The Hon. Mrs.).

On the North Wind—Thistledown. A Volume of Poems. Elegantly bound. Small crown 8vo. Cloth, price 7*s*. 6*d*.

WILSON (H. Schütz).

Studies and Romances. Crown 8vo. Cloth, price 7*s*. 6*d*.

WILSON (Lieut.-Col. C. T.).

James the Second and the Duke of Berwick. Demy 8vo. Cloth, price 12*s*. 6*d*.

WINTERBOTHAM (Rev. R.), M.A., B.Sc.

Sermons and Expositions. Crown 8vo. Cloth, price 7*s*. 6*d*.

WOINOVITS (Capt. I.)

Austrian Cavalry Exercise. Translated by Captain W. S. Cooke. Crown 8vo. Cloth, price 7*s*.

WOOD (C. F.).

A Yachting Cruise in the South Seas. With Six Photographic Illustrations. Demy 8vo. Cloth, price 7*s*. 6*d*.

WRIGHT (Rev. David), M.A.

Waiting for the Light, and other Sermons. Crown 8vo. Cloth, price 6*s*.

WYLD (R. S.), F.R.S.E.

The Physics and the Philosophy of the Senses; or, The Mental and the Physical in their Mutual Relation. Illustrated by several Plates. Demy 8vo. Cloth, price 16*s*.

YONGE (C. D.).

History of the English Revolution of 1688. Crown 8vo. Cloth, price 6*s*.

YORKE (Stephen).

Cleveden. A Novel. 2 vols. Crown 8vo. Cloth.

YOUMANS (Eliza A.).

An Essay on the Culture of the Observing Powers of Children, especially in connection with the Study of Botany. Edited, with Notes and a Supplement, by Joseph Payne, F.C.P., Author of "Lectures on the Science and Art of Education," &c. Crown 8vo. Cloth, price 2*s*. 6*d*.

First Book of Botany. Designed to Cultivate the Observing Powers of Children. With 300 Engravings. New and Enlarged Edition. Crown 8vo. Cloth, price 5*s*.

YOUMANS (Edward L.), M.D.

A Class Book of Chemistry, on the Basis of the New System. With 200 Illustrations. Crown 8vo. Cloth, price 5*s*.

ZIMMERN (H.).

Stories in Precious Stones. With Six Illustrations. Third Edition. Crown 8vo. Cloth, price 5*s*.

LONDON:
C. KEGAN PAUL AND CO.
(*Successors to the Publishing Department of* HENRY S. KING AND CO.)
1, PATERNOSTER SQUARE.

ELZEVIR PRESS:—PRINTED BY JOHN C. WILKINS, 9, CASTLE STREET, CHANCERY LANE.